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321

Teaching Agriculture

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TEACHING AGRICULTURE

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PREFACE

This book is designed for teachers and prospective teachers of agriculture. Most of the discussions are applicable to all levels of teaching, from the elementary to the college level, from children to adults. They are not limited to teaching in schools, for many agencies teach agriculture.

No claim is made that the ideas in this work are original—most of them have been generally accepted and widely used for some time. Indeed, one can rarely be quite sure that his ideas are original; they may be only a simple recollection of what he has observed, heard, read, or been taught in years gone by. Agricultural education is not new in this country; ideas pertaining to it have been evolving for a hundred years or more.

Primarily the effort has been to provide a background of educational concepts, philosophy, and psychology for teaching agriculture. Without a background of understanding, the teacher can have but little to guide him; he has no basis for adapting himself to varying situations or to a changing education in agriculture.

The volume has grown out of the needs and experiences of teachers of agriculture as they have been observed from the standpoint of teacher training, from watching teachers at work in a number of states, and from attempting to help teachers solve their problems over a long period.

As indicated above, the book is not primarily a handbook of teaching devices. But many specific techniques and procedures are suggested, and principles of both group and individual teaching are discussed.

For a critical reading of parts of the manuscript, the author is grateful to the following men: Dr. R. W. Cline of the University of Arizona, Dr. George P. Deyoe and Dr. H. M. Hamlin of the University of Illinois, Dr. Paul J. Kruse of Cornell University, Dr. J. A. Starrak of Iowa State College, and Dr. S. S. Sutherland of the University of California. For similar help he is grateful to his colleagues at the University of Kentucky: Professors T. R. Bryant, L. J. Horlacher, Herbert Sorenson, W. R. Tabb, and J. W. Whitehouse.

CARSIE HAMMONDS

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February, 1950

CONTENTS

Preface v

Chapter

1. Introduction 1
2. The Learning Process 12
3. The Teaching Objectives 51
4. Constructing a Course of Study 63
5. Using Problem Solving in Teaching 96
6. Developing Manipulative Abilities 141
7. Developing Attitudes 153
8. Supervising Practice 163
9. Future Farmers of America, New Farmers of America, and 4-H Clubs 229
10. Teaching Young-farmer Courses 242
11. Teaching Adult-farmer Courses 267
12. Teaching Elementary and Prevocational Agriculture 287
13. Teaching General Agriculture in High School . 297
14. Extension Teaching of Agriculture 304
15. College Teaching of Agriculture 316
16. Evaluation of Student Growth and of Teaching . 326
17. Teaching Agriculture as a Profession . . . 337

Index 345

CHAPTER 1

INTRODUCTION

This book deals with teaching agriculture. Teaching is directing the learning process—the process by which one, through his own activity, becomes changed in behavior. Thus teaching is directing or guiding the activities of the learner or learners so as to result in their learning—in their becoming changed in behavior. The verb *teach* takes a double accusative, that is, it takes two objects: the learner or learners taught, and what they learn as a result of the teaching. It is correct to say one teaches agriculture; it is also correct to say one teaches students; he teaches both. Teaching implies a contemplated learning product. *Good* teaching is so directing the activities of the learners as to result in the largest amount of the most desirable intended learnings and the smallest amount of undesirable learnings. This is good teaching anywhere, any time, in any subject.

Significance of Learning. Behavior may be learned behavior or innate behavior or in part learned and in part innate. Innate or unlearned behavior appears without opportunity to learn it; it simply manifests itself at the proper stage of structural growth or maturity. People at the same stage of maturity are much alike in their innate behavior. So are mammals in general, for that matter. Such behavior tends to be automatic. A very large part of the behavior of lower animals is innate. When a spider spins a web, or birds build nests, or squirrels store nuts, most of the performance seems to be unlearned. However, recent experiments show more learning in such acts than was originally supposed.

The significance of learning is implied when we say that through learning one becomes changed in behavior. Learning makes us different—different from what we were, different from each other. That learning makes us different from each other is evident enough when we reflect on it. Some people can read, some cannot; some people speak one language, some another; some people can use a handsaw well, some cannot; some people can interpret a fertilizer tag, some cannot; some people think highly of farming as a vocation, some do not; and so on. Just as we are different from one another in our learned behavior, learning makes us different from what we were before we learned. When one learns to read, his reading behavior is different from what it was; when one learns to milk a cow, his behavior is different; when one learns to recognize P_2O_5, his behavior is different; when one learns to like Jerseys better than other breeds of dairy cattle, his behavior is different.

Making a list of the things that human beings learn may help one see the significance of learning. Here are a few of the things learned (there is much overlapping in this list; items 1 to 3, for example, might include all the others; item 4 could be found in most of the others):

1. Skills
2. Attitudes
3. Knowledge, information
4. Habits
5. Concepts
6. Principles, definitions, rules
7. Manners
8. Character
9. A vocation
10. Most fears
11. Most personality traits

12. A language (and number system)
13. Ability to read
14. Ability to write
15. Ability to make calculations
16. Ability to solve problems
17. Ability to "think before one acts"
18. Respect for experimental results

It may cause one to appreciate the significance of learning if he will imagine the removal from himself of everything he has learned.

Significance of Teaching. To the extent that learned behavior is significant, teaching must be significant. John Dewey has said that all that is distinctly human is learned. If a man's learning makes him largely what he is, directing the learning process becomes exceedingly important. What one is taught matters a great deal. And *how* one is taught greatly affects the amount, kind, and quality of learning.

What Agriculture Is. Agriculture has to do with farming. It is both an art and a science. As an art it is a composite of manipulative skills in the control of plant and animal life in producing utilities for man. As a science agriculture has its organized body of knowledge of causes, effects, laws, principles, for guiding and directing the agricultural skills. Agriculture is also both a method of making a living and a mode of life.

Agriculture as an Art. The art side of agriculture consists of the manipulative skills acquired by the farmer and may or may not represent "artistic" mastery. Agriculture is a so-called practical art; it aims at a utility. The art side of farming is the *doing* side. The farmer must be able to do what is necessary in producing the utilities. It is in the doing that he makes his economic contribution. The farmer must perform, or have performed, the labor of production and disposal of

his products. This calls for qualifications of specific character, including particular habits of overt activity and standards of achievement. These constitute the skills. As Dr. T. H. Eaton years ago pointed out, "Skill is predicated upon awareness, selective adaptation to purpose more or less definitely con-

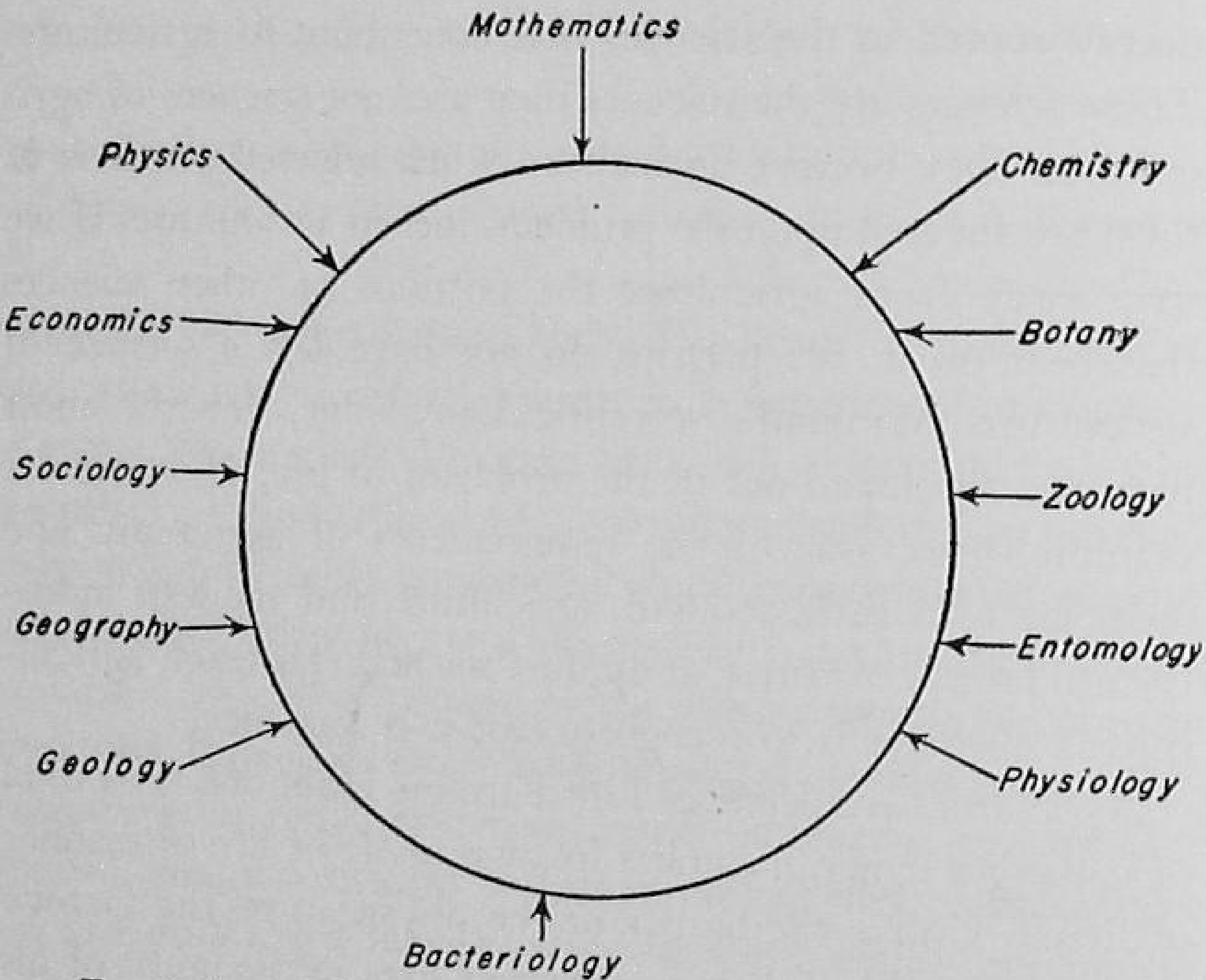

FIG. 1. Some of the sciences that contribute to agriculture.

ceived." Always, according to the Dictionary of the French Academy, art is a complex of processes or means combined with a view to a definite end, whether this end be the useful, the true, the good, or the beautiful.

Agriculture as a Science. What makes modern bridge building a science? Men have built bridges of one kind or another for ages. But bridge building has not always been a science. With the development of mathematics and physics, there arose the possibility of building bridges more efficiently and of building them under conditions which previous methods could

not cope with. Selected portions of mathematics and physics were brought to bear on the problems of bridge building to solve in practice the difficulties that presented themselves. Bridge building had become a science.

What makes agriculture a science? The "organized body of knowledge" which we call the science of agriculture is deeply rooted in the sciences that contribute to agriculture. These sciences are the sciences they are, not sciences of agriculture. They become agriculture when selected portions of them are focused upon the problems met in agriculture. If we strip away from agriculture the portions of other sciences that bear on it, we perhaps do not have left a science of agriculture. Mankind's scientific knowledge, for the most part, has developed out of the problems of life. (Botany, for example, grew out of the requirements of agronomy and medicine.) In turn, modern agriculture and modern industry are largely a matter of applied science. To teach agriculture as a science is to recognize that it is a science.

Agriculture as a Mode of Life. Farming is not only a method of making a living, it implies its own mode of life or manner of living. Unlike the barber or the physician or the factory worker, the typical American farmer lives in the midst of his vocation day and night and every day. There he eats and sleeps, gets most of his recreation, spends most of his leisure. The aspects of life ordinarily thought of as separate from vocation seem to be less separate in farming than in almost any other group of vocations. The life needs of a farmer, apart from vocation, are not all identical with those of people who follow other vocations. This is often overlooked by those who plan education.

Farming is more of a family affair than most vocations; nearly all members of the family perform some agricultural activity. This fact has its implications for education.

A Farming Vocation. A vocation in agriculture is a specialized undertaking. There are many vocations in agriculture —many vocations in farming. An apple producer in Oregon and a cotton producer in Alabama do not follow the same vocation. Each follows a farming vocation. In a farming vocation one produces economic goods or services beyond his own needs and exchanges his surplus for the desired surplus of goods or services produced by others. This implies division of labor and mutual dependence; it is the economic aspect of an agricultural vocation. There is also what has been termed the "calling" aspect of the vocation. The dictionary defines vocation as one's calling in life. The word vocation had its origin in the Latin verb *vocare*, to call or summon. Thus a vocation means a calling, an inner urge, a central interest in life. A farming vocation approaches completeness for a person in the degree that while producing economic goods and services for others he finds the greatest satisfaction for himself. This satisfyingness, or subjective phase of vocation, should not be left out of consideration in teaching agriculture.

Aims and Functions of Agricultural Education. Agricultural education may serve one or more of several purposes. The purpose or purposes should always be known, and the education in agriculture planned and evaluated accordingly.

The aim of *vocational agriculture* is preparation for a vocation or occupation in agriculture. The aim of this education in agriculture under the Federal acts is "to train present and prospective farmers for proficiency in farming." Thus the aim is proficiency in a specific farming vocation; there is no doubt about it. The training is for people who are already farmers and for those who are to become farmers. The aim is stated in the organic Federal act (Smith-Hughes Act, in 1917), and Federal money is appropriated to accomplish this aim.

Years ago Dean Alfred Vivian of The Ohio State Agricultural College said, "Vocational agriculture is for the purpose

of teaching farming, and success in farming is measured by achievement on the farm." Vocational agriculture under the Federal vocational acts is below college level.

The aim of *prevocational agriculture* is not a vocational aim. *Pre-* means before. Any prevocational agriculture there may be is given before the pupils take a vocational course. Such agriculture may serve as a background for later work in vocational agriculture. It may lay a foundation for the vocational work and may have guidance value. It should best serve its purposes, whatever they are conceived to be.

General agriculture as a school subject must have its own objectives. The term "general" indicates that general agriculture belongs in the realm of general education—those learnings desirable for all persons. Vocational agriculture, on the other hand, is for those preparing for a vocation, a specialized undertaking for the sake of a livelihood.

College agriculture is usually vocational, that is, it prepares for a vocation. However, most of the curriculums (and therefore the courses in them) are for people in preparation for the professions. Professions are vocations. They are different from other vocations in that they call for more advanced special school training, college training or beyond. A curriculum is a list of offerings for a special group of students. A college of agriculture may have many curriculums. It may have a curriculum for training county agricultural agents, another for training teachers of vocational agriculture, another for agronomy majors, another for animal industry or dairy majors, another for horticulture majors, and so on.

Agricultural extension is a form of agricultural education and has its own purposes which are largely vocational in nature, at least with the adults. The purpose, in the words of the Smith-Lever Act, is "to aid in diffusing among the people of the United States useful and practical information on subjects relating to agriculture, and to encourage application of

the same." The work of extension consists of the education activities of the college of agriculture for people not enrolled in its college courses. It includes 4-H club work for boys and girls and work with men and women.

Whether agricultural education be vocational or general in nature, it must be significant and worth while for the learners when compared with other things they might learn instead. People cannot learn everything; they should learn that which is of the greatest worth to them—that which most vitally affects them. Nearly all rural people not only have a background (apperceptive basis) for learning agriculture, but they deal with agriculture in one form or another all their lives. It is possible for agriculture to be a truly educational subject.

Importance of Vocational Education in Agriculture. Aside from the need for continuous education by people already farming, each year in this country approximately 200,000 new farm operators enter farming and more than 150,000 people enter agricultural occupations other than farming. It is rather generally conceded that people should receive formal training in and for the work they will follow. A very large part of the activities in one's productive life span are in his vocation. A normal adult is occupied with his work most of the time he is awake. Success in one's vocation is exceedingly important, from the standpoint of the individual and from the standpoint of society. Society demands that the economic capacities of every normal person be so developed that he can earn a respectable living for himself and those who may be dependent on him. It is an individual's birthright to receive such an education.

Every new machine makes it more difficult for those who do not use that machine. When all farmers cut hay with a scythe, no farmer was at a disadvantage in hay cutting. But when some farmers began to cut hay with a mowing machine, those who continued to use a scythe became relatively worse

off. So it is within a vocation, and when one vocation is compared with another. Training, improvements in technology, improved practices, constitute a "new machine." For people in vocations other than farming to receive helpful vocational education in any form while farm people do not receive vocational education is to make farm people relatively less efficient producers of vocational products. Thus they become relatively worse off. The same thing may happen within an occupation. If farm people in some states or in some sections of a state do not receive effective vocational education in agriculture, these people become relatively worse off compared with people who do receive such education.

Vocational education of the right kind increases production per person. People can have only what they produce. When people produce but little per person, they can have but little per person. People in China and in India have little per person because they produce little per person.

Improvements of production in agriculture free men to work in other fields, thus increasing total production of economic goods and services and benefiting all mankind. No people would have automobiles, good roads, the present modern homes and home conveniences, quality clothing, hospitals, libraries, and such things of today unless workers could be spared from food production.

Rural life must be made as attractive to the ambitious and capable young man and young woman as life in the cities. Good farming can support a high standard of living. Good farming calls for good farmer training.

Other Educational Values in Agriculture. Educational values in agriculture are not limited to people who enter an agricultural vocation. Learning in agriculture may be used in a multitude of other vocations. One may use his agriculture in dealing with nearly any rural-life problem or in serving rural people in almost any way. All of the following people would make much use of education in agriculture: rural educators,

ministers, lawyers, bankers, writers, doctors, health workers, merchants, and the host of people who follow an agricultural vocation other than farming.

Agriculture is a human activity—a form of human experience. More than one-third of the employed male labor force of the United States engages in this form of human activity (farming and agricultural vocations other than farming). Human activities and human experiences should constitute the bulk of education. This education has meaning; it is related to life. It is related to life in categories beyond the vocational: from the standpoint of leisure and recreation, from the standpoint of understanding and appreciating one's environment, from the standpoint of culture that is real and not pseudo.

For rural people (people other than city people) agriculture is a natural form of organization of subject matter. Selected portions of the sciences brought to bear on the problems of the farm and farm home could well result in a very functional type of science teaching.

Children reared on the farm or in an agricultural environment should have their farm experiences reinterpreted to them. They have seen crops, farm animals, soil, insects, weeds, and the like. One of the biggest things that education can do for a people is to reinterpret to them their experiences, give them a new world in which to live. When agriculture is properly taught, crop production, fertilization, how plants make their food, farm animals, feeding animals, soil, soil erosion, insects, and such things come to mean vastly more than they ever meant before. No one who comes to understand any of these phases of agriculture will again live in the same world he has lived in. Reinterpretation of experience is almost the essence of education.

Subsidizing Education in Agriculture. Much of the work in agricultural education is subsidized, in part, by the Federal government. This is true of vocational agriculture under the

Federal acts, agricultural extension, and the college teaching of agriculture. Workers in these fields should not feel apologetic for the Federal aid. The country has always subsidized the city. Most of the wealth is in the cities. Dr. C. J. Galpin said, in prewar times, that the country loses 150 million dollars a year because prosperous farmers move to town and take their money with them. In more inflated times the amount would be much greater. Dr. O. E. Baker estimated that from 1920 to 1930, 300 to 400 million dollars a year went to the city because young people who move to the city inherit their share of the farm property when their parents die and the estate is divided. Approximately one-fourth of the children reared in the country go to work in the city. The city gets these workers after they have been schooled or partly schooled at the expense of the country. Dr. Baker estimated that, for the decade mentioned, there flowed to the city each year $1,400,000,000 in this way. So, from this angle, it would seem only right that the Federal government use some money —collected from everywhere, but mostly from the wealthy urban centers—in contributing to the education of rural people.

There are other reasons, of course, for subsidizing education in agriculture. Such education helps conserve the soil, a natural resource. It contributes to producing an adequate supply of food and fiber by a smaller number of people. All people are benefited thereby. In increasing rural wealth, a larger market is provided for the manufactured products of the city. In helping provide education for rural people, the young people who migrate to the city contribute more to the city by virtue of their education. Also, the more educated a rural people, the greater the amount of wealth that will flow to the city in ways other than migration.

CHAPTER 2

THE LEARNING PROCESS

With Some Implications for the Teacher

Teaching is directing the learning process. A teacher should understand the process he directs. There are at least two important implications for the teacher of agriculture in the statement in Chap. 1 that learning is the process by which one, through his own activity, becomes changed in behavior. Let us examine these implications.

Learning is an active process. One learns through his own activity, through what he does. Each person must do his own learning; no one can learn for him, as no one can engage in an activity for him. Learning cannot be imparted or given to another. One cannot bequeath learning in his will when he leaves this life. Neither can a teacher at any time give learning to others in any form. He may give others apples but not learning. The teacher can direct or influence the learning process only by directing or influencing the activities of the learner. The learner learns through the activity he engages in, and in no other way. Activity is essential to learning, but it may not be adequate for learning, as will be pointed out later.

Learning results in a change in behavior. The change may be in doing behavior, knowing behavior, or feeling behavior. One has not learned if he behaves just as he did before. If one has learned to drive nails, his behavior is different from what it was. (Of course, change in nail-driving performance may not affect other behavior.) If one has learned to recog-

nize a legume, his behavior is different from what it was. If one has learned to have a certain feeling toward livestock eager to be fed, his feeling in this respect is different from what it was. Learning is always manifested as change in performance. It is not limited to desirable changes in behavior. Undesirable changes may take place as well as the desirable and in the same manner.

Some Principles of Learning

Three basic principles are singled out here for discussion: the principle of practice, the principle of effect, and the principle of association. Many subsidiary principles are stated.

The Principle of Practice. This principle may be stated as follows: *What is learned is what is practiced; continued practice or use is usually necessary for retention of the learning.* By practice is meant performance or some number of performances.

This is perhaps the most abused principle of learning. Thorndike practically renounced the law of exercise or use in his 1932 and 1935 writings, as a safeguard against misuse of the principle, and because certain theories had been disproved that were formulated in support of the principle. Although practice or use seems to bring a change in performance because it permits other learning factors to be effective, these factors operate only in the practice. Learning does not go on without practice. Perhaps nobody contends that practice is not necessary to learning. And perhaps all would agree that five recurrences of conditions favorable to learning are of greater consequence than three. The rejection of certain theories that purported to explain how learning is achieved by practice should not cause us to lose sight of practice as an essential condition to learning.

Practice does not refer to mere repetition of the act. Mere repetition is unproductive for learning. To repeat the act,

literally, would be to do it exactly as it was done before—with the same speed, same lack of expertness, and same everything else. This, by definition, would not produce learning. (Learning implies a change in behavior.) Learning does not depend solely on the number of uses or times practiced. There are degrees of intensity of use or practice, and there are differences in the ability of people to acquire the particular learning. With enough intensity or vividness, a single use may produce rather permanent learning. As the intensity approaches zero, so does the learning tend to.

Practice or use is not limited to manipulative use. There is mental use; attitudes or feelings are used. The ideals and standards to which one reacts are a part of use, a part of practice.

In elementary illustrations the principle of practice is easy to accept. For example, each time one thinks 81 when 9 × 9 is presented, or thinks and says 81, or thinks and writes 81, the 81 response to 9 × 9 tends to be made more certainly, more promptly, and with less effort. The same general thing would be true in recognizing a red clover plant, in dehorning a calf, in being thrilled at seeing a field of waving wheat. By the same token, if for a long time one does not use 9 × 9 in any way, the 81 response will tend to be forgotten. One tends to lose his calf-dehorning skill in a period of nonuse; his thrill at a field of waving wheat may likewise disappear.

Implications and Applications for the Teacher. The principle of practice has many implications and applications, several of which are here stated.

What we learn is what we do. This implication is much misunderstood. We often hear that "practice makes perfect" and that "one learns to do by doing." These are half-truths. Practice or doing does not necessarily improve quality of performance. The wrong practice tends to get the wrong learning. One may practice an error as truly as something else. Ordinarily one does not correct his error by repeating it. Here

we see the necessity for guidance in learning. It behooves the teacher to know what is being practiced and to get practice of that which is to be learned. The learners learn what they *do*, not what they are told or read or what they see others do. In order for the teacher to teach, he must get the learner to do what is to be learned. The learner can be taught only what he can be caused to do. The reactions that are learned are the reactions that are practiced. If the better way is not practiced, the better way will not be learned.

Practice or use with a minimum of self in it produces a minimum of learning. The quality, the aim, the meaningfulness of the activity, the self put into it, the vividness of experience, produce the learning.

Even the functioning of a fact depends on the way it has been acquired, used. Use of facts in life situations must not be expected if the facts have been memorized only and have not been used in life situations.

Continued use of the learning is usually necessary if the learning is to be maintained. It is practically always necessary unless the degree of overlearning is very great. Overlearning refers to the learning above the threshold of reaction—above the point of being barely able to perform. The accompanying figure illustrates roughly the probable curves of forgetting

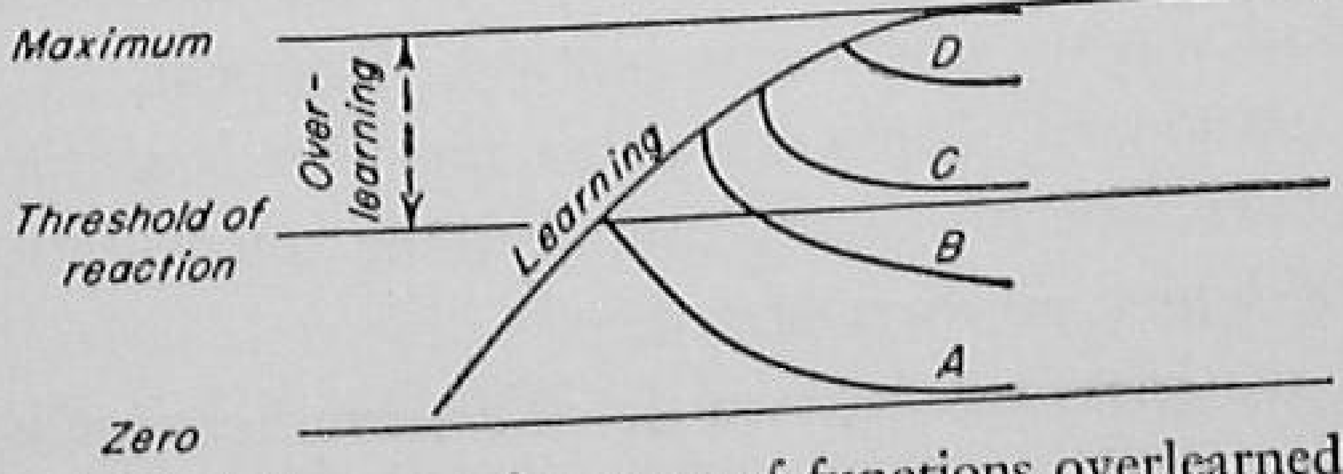

Fig. 2. Probable influence of nonuse of functions overlearned in various degrees. Curve *A* shows the forgetting that occurs when the function is barely overlearned; only a small loss carries the learning below the threshold of reaction. Curves *B*, *C*, and *D* show the probable forgetting that occurs when the overlearning is slight, considerable, and great, respectively. (*Adapted from Educational Psychology by Gates, et al., The Macmillan Company.*)

which may follow various stages or degrees of overlearning. Other things being equal, the rate at which forgetting occurs depends on the extent of the overlearning. Or, stated differently, retention increases as the degree of overlearning increases. If the learning is to be very permanent, there must be a large degree of overlearning, continued use of the learning, or a combination of the two. A function barely overlearned and not soon used again is almost sure to be forgotten. Thus the need for rigid selection of what should be much overlearned so as to have time to teach it, the need for securing sufficient overlearning, and the need of providing for use of what is learned.

Again we should bear in mind that practice or use does not refer to mere repetition. Skilled performance cannot be attained by sheer repetition, which reproduces all the errors and inadequacies of the former trial. But practice is not repetition. As one practices, he is drawn toward the ideal he accepts. His responses approach his standard of perfection or excellence. This standard is a part of what he reacts to, a part of his practice. Activity does not result in improvement of performance irrespective of the standard of perfection in the mind of the learner. The learners should have worthy ideals to be drawn toward as they engage in their activities. It is the business of good teaching to supply or establish the ideal in the mind of the learner—the ideal of performance, the ideal of attainment, the ideal of what constitutes the good or correct.

The teacher must realize that the principle of practice operates in undesirable learning just as it does in desirable learning. One always learns what he does, not something else. The boy disliking record keeping is learning to dislike record keeping. The boy feeding pigs corn only is learning to feed pigs corn only. The boy using a handsaw incorrectly is learning to use a handsaw incorrectly. The boy "jumping to con-

clusions" is learning to jump to conclusions. The boy loafing is learning to loaf.

If the activities of the learners are to result in the largest amounts of the most desirable learnings and the smallest amounts of undesirable learnings, there should be supervision of the activities engaged in. Supervision is necessary in order that there may be satisfying and understanding practice of the correct procedures and that the incorrect procedures may be detected and eliminated. Mere recurrence of situations or reactions cannot be depended upon to secure improvement in performance.

The Principle of Effect. The principle of effect may be stated in this manner: *Satisfyingness or annoyingness of the practice promotes learning in so far as it makes for vividness of experience, and promotes or hinders learning in so far as it encourages or discourages further practice.* As we have already seen, intensity or vividness of experience is an essential factor in learning. The above statement of the principle of effect says that satisfyingness promotes learning in two ways: by making for vividness of experience, and by encouraging further practice or use. Annoyingness also promotes learning by making for vividness of experience. That the learner may be learning *not to* does not matter; it is still learning. Learning not to make the error, for example, is to learn. Learning not to put one's hand on a hot radiator is learning not to. Annoyingness hinders learning to do a thing in so far as it acts as a deterrent to further practice. Obviously, annoyingness does not promote practice.

It should be recognized here that learning to do a thing consists of something other than *not doing* certain things. Not doing the things that have been learned may give forgetting an opportunity to take place, but it produces no learning. (If not doing produced learning, all of us would learn a great deal.) What is done produces the learning, rather

than what is not done or avoided. Always one must do what he wants to learn to do.

Implications and Applications of the Principle. Every good teacher makes a great deal of use of the principle of effect. The implications and applications for securing learning are many.

What activities prove to be satisfying and what activities prove to be annoying to the learners is of tremendous importance to the teacher. We tend to practice, and therefore learn, those things that give us satisfaction. We tend not to practice, and therefore to forget or not to learn, those things that give us annoyance. Learning many of the things we would learn requires much practice.

The fastest learning is usually achieved where both satisfyingness and annoyingness are judiciously used; satisfyingness when the responses are right, annoyingness when the responses are wrong. The learner must have knowledge of his success and of error if success is to be satisfying and error annoying. Obviously, the teacher must have such knowledge in order to direct the learning process.

Success and error from the learner's standpoint, and therefore the satisfyingness and annoyingness, are closely related to the learner's goal. If the learner's act contributes to the attainment of his goal, he tends to find the act satisfying. If his act interferes with the attainment of his goal, he tends to find it annoying. One is annoyed by his error when he realizes that the error interferes with his getting to where he wants to go. Most learning is for the sake of reaching a goal. So, usually, one of the first steps in securing economical learning is to establish a goal in the mind of the learner.

Genuine *wants* have a great influence on one's learning because they may determine what will be satisfying and what will be annoying, and the degree of the feeling. Generally speaking, people select and learn those things that lead toward

the attainment of their goals and purposes, their wants. People are willing to tolerate considerable annoyance—do things that would not in themselves be enjoyable—if they think their acts are helping them attain a highly valued goal. It is the business of the teacher to develop worth-while wants and goals. One's goal, of course, is related to the ideal he accepts, whether it is an ideal of performance or some other ideal.

In working with the principle of effect, not against it, the teacher can profit by his knowledge of states of affairs that men tend to find satisfying and states of affairs men tend to find annoying. Here are some things that normal human beings tend to find satisfying (there is, of course, overlapping in the list):

Activity, in mind and body (when well and rested)
Approval, recognition
Success, effective effort
Ownership
Acquiring property or skills (abilities)
Creative effort
Mastery—of situations, subject matter, things, etc.
Achievement
Service to others
Confidence
Security
Freedom
Zest (not boredom)

Here are some things normal human beings tend to find annoying:

Inactivity (when well and rested)
Disapproval, social or other
Failure

Derision
Feeling inferior
Embarrassment, chagrin
Being neglected
Fear
Not being permitted to participate in what others are doing
Having to be active when tired
Insecurity
Interference with their behavior by commands or restrictions
Boredom

The teacher should be on guard when annoyingness is operating very long, lest the intended learning be at the cost of acquiring attitudes which may seriously interfere with later use of what was learned. The boy who dislikes record keeping, for example, may stop keeping records when free to do as he pleases.

The teacher should beware of rewarding undesirable behavior and of making desirable behavior annoying through punishment or otherwise. Rewarded behavior tends to be repeated and therefore learned. To reward errors or other forms of undesirable behavior is to encourage them. To make behavior annoying tends to eliminate it.

Because satisfyingness promotes learning by making for vividness of experience and by encouraging further practice, the teacher should make learning an essentially satisfying process whenever possible. Each learner should be encouraged to undertake work suited to his needs and capacities. Since successful achievement is satisfying, the teacher should strive to make success possible on the part of the learners and that from the very beginning. Successful achievement does not mean that the work should be easy. Rather, achievement im-

AG248

plies some degree of difficulty overcome. But learners need the stimulus of success. In the words of Gates,[1]

> Success reinforces performance, releases further energy, and engenders favorable attitudes toward learning. Repeated failure, on the other hand, puts a drag on learning. Constant frustration discourages effort, gnaws viciously at interest, and begets indifference, resistance, or even severe inferiority.

There is nothing in the principle of effect to justify the belief that education should be a matter of entertainment—that learners should do just as they please, study only what they like, work only when they want to, have "a good time." From the brief list of things human beings tend to find satisfying, one would probably conclude that satisfaction has a deeper significance than "pleasure." Likewise, life presents us with many things we should like to avoid which cannot be avoided by doing just as we please. Under skillful teaching, pupils may learn to like what they now dislike, their present interests may be changed. Securing this learning is part of the job of the teacher.

The Principle of Association. A broad statement of this principle is: *Experiences that occur together tend to recur together.* The principle was first stated in terms of association of ideas. The above statement includes not only ideas, but feelings and acts. It applies in knowing behavior, doing behavior, and feeling behavior—knowledges, abilities, and attitudes. Experiences do occur together. Having occurred together, they tend to recur together.

"Occurring together" is not limited to simultaneous occurrence; many experiences occur in a sequence, one following another in succession. Occurring in succession is also occurring together. Much of our behavior consists of such a

[1] Gates, *Educational Psychology*, 1942, p. 394.

chain of reactions, each reaction or experience being a stimulus for the next one, as a-b-c-d-e-f-g-h experiences.

Common observation makes the principle of association seem plausible. This dwelling house causes me to think of the people who live in it. Knife suggests fork. A line of poetry calls for the next line. When one sees a lemon, its taste, "feel," and weightness tend to be experienced. The expression "corn tassel" tends to cause us to recall that part of a corn plant. Our mouths "water" if some appetizing food is presented when we are hungry. When the car slows down too much on a steep grade, we tend to shift into second. Boys who have been afraid of the teacher or bored by him in the classroom will be likely to have a similar feeling when they see him coming to their home.

Implications and Applications in Teaching. Since experiences that occur together tend to recur together, it behooves the teacher to see that the desired experiences of the learner do occur together. The teacher must know that the principle applies in all three of the forms of behavior and in any combination of the three.

The teacher should teach significant facts in useful associations in order that they may be used when the need arises. This is necessary in teaching vocations and is no less so in other teaching. Even a science may not function in application unless the connection or relation is made in teaching-learning. We often fail to use our mathematics, chemistry, physics, botany, or bacteriology in solving problems in agriculture whose solution involves using these sciences, simply because the science has never been experienced in relation to such problems. Of course, merely memorized facts should not be expected to be used in life situations. The situation that elicited the recall of the memorized fact is the situation that would tend to elicit it again, not some other situation.

Theory and practice should be bound together in learning

if they are to contribute to each other—if they are to recur together. Agriculture, properly taught, is not practice without theory, neither is it theory without practice.

The seeing of relationships is necessary in most learning; it makes the learning easier, and gives meaning to the thing, event, or situation. Ideas that are connected with one another tend to hang together. It is not enough that the things be related to each other for the relationship to operate in learning. The relationship must be *apprehended*, *seen*, *felt*, by the learner. In addition to experiencing things together, *awareness* of relationship intensifies experience and makes relatively important stimuli prepotent. Suppose, for example, that one sees some nodules on the roots of legumes and there is revealed to him the part that nodules play in nitrogen gathering. One, for the time being, is attentive to this relationship, not to soil color, or how the person holds the legumes, or to other people around, or to the blueness of the sky.

In manipulative skills it is quite easy to see that experiences that occur together tend to recur together whether or not ideas as such enter in. For example, in sawing boards with a handsaw, the manner of holding the saw, the starting of the cut, the angle of the saw while cutting, the downward stroke, the feel of these things, and whatever understanding or "why" there may be, are experiences that occur together. There are sequences of acts, relationships, and the like in the experiences. Only what has occurred together may be expected to recur together.

In the realm of feeling behavior—attitudes—the essentials are the same. If boys have experienced only annoyingness and dislike in their study of dairying, the feeling of annoyingness and dislike may be expected to recur whenever dairying is mentioned. If, on the other hand, the boys have experienced the glow of satisfaction from a job well done or anticipate with some eagerness the uses they will make of what they

learn, we can expect this kind of a feeling to recur when dairying is mentioned. Any attitudes that are to be built into behavior patterns need to be set up for learner participation.

Seeing that the desired experiences do occur together in the learning is a mark of a skillful teacher or a skillful learner. If, for example, one is to learn to recite the first line of a stanza of poetry following the last line of the preceding stanza, the two must occur together in the learning. Going from the last line of a stanza to the first line of the same stanza will not do. The different acts in starting an automobile must be experienced together if one is to become able to start a car. Whatever is to be learned together should occur together in the learning. If a sequence of acts is to be learned, the sequence must be experienced. However, a common error of teachers and of learners should be pointed out here—the error of continuing to practice an entire sequence from beginning to end in order to correct a weakness in the learning that might easily be discovered and singled out for correction. It may be that the learner is doing only one thing wrong which keeps the total performance from being successful. For example, a student may be doing a poor job of painting because he gets too much paint in the brush. Then the learning may be speeded up enormously, and the satisfaction from it greatly increased, by discovering and eliminating the particular defect or defects. This is a major job of a teacher. The good teacher never assumes that the learner is making no errors.

The teacher of agriculture must understand the principle of association if he is to get improved practices carried out on the home farms of the learners. One tends to respond to the old situation as he has responded to it before. The situation on the home farm has been eliciting a particular response; certain experiences have been occurring together there and will tend to recur together there; the same practices may be expected to be carried out as have been carried out unless

some very definite functional learning contributes to the behavior on the home farm. What the learner learns will constitute the only new element in the old situation. If it is not positive and significant and clear, the teacher should not hope for a change in practice.

The teacher who works with the principle of association will realize the necessity for good organization of experiences —good organization of subject matter. To organize is to plan things in their proper relationship. A series of unrelated fragments of learning does not constitute good organization. It is possible to have good organization of subject matter in teaching agriculture and to bring the subject matter to bear on the problems of farming. To neglect either of these is to make the teaching less effective.

Some Selected Aspects of Learning

A few aspects of learning are discussed here, because of their special significance in teaching. These aspects are generalization, acquiring meaning, observation, and habit formation. Reflective thinking, an aspect of learning, is discussed in Chap. 5 on Using Problem Solving in Teaching.

Generalization. The psychological concept of generalization is rich in its implications for method in teaching. When has one generalized? Let us answer this question by illustrations, as nearly as we can.

Suppose a child can say "one, two, three, four" and that we hold up three fingers and tell him, "This is three." The chances are that "three" now means only fingers to him; it belongs only with fingers. If he were asked to pick up three marbles, he would not be likely to respond appropriately. Even after he can take hold of three of our fingers "to show he knows three," he probably cannot recognize threeness wherever it may occur—three pigs, three books, three boys, and so on. Only when three can be recognized in other situa-

tions containing it, has the child generalized on threeness; only then can he use three *generally*.

Suppose an older child knows that this object is called book; this one, shoe; that one, man; that one, star; he knows the names of many objects. He now is told or reads that "a noun is the name of an object, place, or thing" and three illustrations of nouns are given: boy, shoe, and Atlanta. He cannot yet pick out the nouns on a printed page unless he has generalized on nounness, which he probably has not. He may be able to repeat the definition of noun and give boy, shoe, and Atlanta as illustrations, but he does not recognize noun as belonging to all names of objects. Only when he can recognize a noun in any ordinary situation containing it, has he generalized on nounness.

And now Gates's[2] illustration of square. A mother had attempted to teach her child the meaning of square by showing it the top of a box while the word "square" was repeated and explained. When the father was told of the lesson, he held up a square piece of paper, asking, "What is this?" "A paper" was the response. "Yes, but what kind of a paper?" "A white paper," etc. No effect of the lesson could be seen by the use of square cards and other objects, but when directly asked, "What is square?" the child ran to the box, exclaiming proudly, "This is square." The child had not generalized on squareness. Whatever may have been recognized as shape belonged with the box top only. Square could not be seen in a square paper, or handkerchief, or table top, or drawing, or window pane, or floor. Only when the child can see square in the many situations containing it, has he generalized on squareness.

One has generalized on an element or combination of elements when he can recognize and use it appropriately in any

[2] Gates, *Educational Psychology*, 1942, p. 449.

ordinary situation containing it. Generalization is seldom so complete that one would always be able to recognize or use the element in a new situation. There are degrees of generalization.

Commonness of Generalizations. Much of our learning consists of generalizations. Without them our learning would be meager indeed.

Every principle is a generalization. To teach a principle is to secure generalization on the part of the learners. There are many principles to be taught in agriculture. A principle indicates an element of likeness common to a variety of situations; else it is not a principle, it is not *general* in application. The principle that "legumes when inoculated (and when the soil is not rich in nitrogen) take nitrogen from the air" applies to all legumes—alfalfa, red clover, white clover, sweet clover, lespedeza, garden peas, sweet peas, beans, locusts, and the others. It applies whether the legumes are annuals, biennials, or perennials; whether they are large or small; whether they are good for hay or not; whether or not their bloom has a pleasant odor; whether they have large leaves or small. A principle indicates an element of likeness; this one, an element of likeness common to legumes.

Every definition is a generalization. When we say, "A noun is the name of an object, place, or thing," we are giving the definition of noun. Someone generalized in arriving at the definition; he discovered and stated the essential characteristic of nounness, an element of likeness in nouns.

Rules are generalizations. Take, for example, the rule for pointing off decimals in multiplication: "Point off as many decimal places in the product as there are places in the multiplicand and multiplier combined." This rule indicates an element of likeness common to all cases of multiplying decimals. The rule applies when only the multiplicand has decimals in it, when only the multiplier has decimals in it, when both

have decimals, when the numbers are large, when they are small, and under all other conditions. So it is a rule one can follow.

Concepts are generalizations. To form the general concept of cow or of squareness, for example, is to generalize. At first one's concept of cow is concrete and individual and applies to the specific cow with which one has had experience. Later, having had experience with many cows, it becomes abstract and general, applying to cows of all kinds and not tied up with the image of a particular cow. Concepts are the products of experiences. Rich experiences are necessary to rich concepts.

Every standard one may have is a generalization. So, too, is every ideal one may have, which is a kind of standard for the future.

Implications and Applications for Teaching. The importance of generalization we have seen, at least in part. Teaching consists very largely in securing generalization by the learners. As in other learning, the learner must do the learning—he must do the generalizing. A generalization cannot be handed to one.

It is clear by this time that being able to repeat a statement read or heard is no indication that one has generalized. One has generalized only when he is able to recognize or otherwise use the element of likeness in a new situation containing it. In a very true sense, one does not know a principle, rule, or other generalization until he is able to recognize or use the element of likeness in a new situation. One does not know squareness in any usable form so long as squareness belongs only with box top; he does not know a principle of fertilizing crops so long as the learning is tied up with corn only. Memorization and generalization are very different things.

The best evidence that one possesses a generalization is behavior that would have been impossible without the general-

ization. Learning always represents change in behavior. Generalization can be, and often is, a subverbal process; that is, it may not require language. For example, you know a chair or a corncob when you see one but probably have never put into words what a chair or a corncob is. Farmers have many clear, functioning concepts and know well how to do many things which they do not put into words. We who may have more training in the use of language should not deceive ourselves into believing that a farmer knows little and we know much. The reverse may be true when it comes to concepts and other generalizations necessary to success in the vocation. A person who succeeds in a vocation usually has clear concepts regardless of his use of language.

Generalization comes about through a process of development. While one may generalize from a single instance, it is rare. We can hardly conceive of a child's generalizing on squareness from seeing a box top only. Usually there is need for several situations containing the feature to be generalized. Generalization occurs by reacting to the feature that is common in the situations. This fact is a cue for the teacher in securing generalization. Usually he should select several situations containing the element to be generalized. The element should be as obtrusive and discernible as possible, not obscured by irrelevant detail; it should be real, true. The element should be made prepotent. This may involve establishing a state of readiness in the learners; it often involves guiding attention to the element through questioning, explaining, and in other ways. Contrast of elements is often helpful in making an element stand out. For example, if one were teaching the characteristics of grasses, contrasting the leaf attachment of grasses and of legumes would help make the clasping corn leaves (and the petiole leaves of legumes) prepotent over the other features in the situation.

Mere multiplication of objects or instances will not secure

generalization, but may hinder it. The element to be generalized must be brought into the field of thought. There may be a working back and forth from one illustration to another—sometimes always back to the first illustration if it is a good one, comparing, contrasting, observing.

Old-time drill—going over material again and again in the same manner—does not promote generalization. For generalization to take place, there should be varying illustrations, cases, procedures, new situations. If drill is to be used and generalization is desired, let it be drill with a varying background.

There is often a danger of introducing the statement of the generalization (principle or definition, for example) too early for the amount of experience the learner has; he may take the statement, perhaps try to memorize it, and fail to generalize. This is not to say that there should be no statement of the generalization (though sometimes there need not be). But the statement should come at a time when it will throw light on the facts of which it is a summary or generalization and when it will be made clearer by them. A good general rule to follow in teaching is: Develop the concept before presenting the term or statement that stands for the concept.

The discovery of a principle (element of likeness common to a variety of situations) for one's self is usually more effective in learning than when it is pointed out by another; it is a more vivid experience. Accordingly it is very desirable that the teacher preserve on the part of the learner the feeling that he is the discoverer and not a mere witness of an explanation. Often the skillful teacher can deal with the cases in such a way as to foster the feeling of discovery on the part of the learners.

Generalization is the basis for transfer of learning—the learning of one thing being carried over into something else. In order for a transfer to take place, whatever is to be trans-

ferred must be generalized. Unless generalization has taken place, the common element or combination of elements will not be recognized or used in the new situation. For example, in the teaching of feeding hogs, the boys may learn that growing pigs need a larger percentage of protein in their feed than do mature hogs. The fact may be tied up with feeding hogs only. That is, it may not be generalized—may not be transferred to the feeding of calves, lambs, colts, growing chickens, boys and girls. The need for protein is not recognized in a new situation. If the learning is to be used in new situations (and nearly all worth-while learning is to be so used), generalization should be taught by the teacher.

Acquiring Meaning. Every person *learns* all the meanings he has. He does not inherit them. One acquires meanings through his experiences. The things in one's environment take on the meaning which they have for him as he has experiences with them. Meanings do not reside in objects or in symbols. Even the meaning of a word (which is a symbol) depends on what it represents in our experience—what we have done with it, how we have used it, how we have reacted to it. The more we know about the learning process, the more we realize the need for experience by the learner. The dictionary defines experience as "personal participation in or observation of the realities of life." Meanings depend on experience.

The child begins acquiring meaning with his sensory experiences—reactions. He uses his sense organs—eyes, ears, and others. By a combination of sensory experiences he comes to know bottle, rattle, hand, foot, bed, dog, and other objects. However, he can know each object only in terms of his experience with it. For example, he can know bottle only in terms of his bottle experiences. If his experiences include only a clear glass bottle, of particular size, with a rubber nipple on the end, containing milk or water of a particular temperature, then bottle cannot mean anything else to him.

To grasp the meaning of a thing is, essentially, to know what uses it can be put to, how it operates or functions, what it will do, and the like. Thus a candle may mean something that will burn one if he touches it. But a candle cannot mean pain until one has been burned. A cloud may mean rain. But the cloud cannot mean rain until one has seen, heard, or felt rain dropping from a cloud. Meaning comes out of previous experience.

Implications for Teaching. The fact that meanings come from experience has many implications for teaching agriculture. In attempting to teach, the further we get away from firsthand experiences of the learners, the hazier their ideas are likely to be. To use John Dewey's illustration: If a child has never seen a zebra but has seen a mule, I can enable him to get some idea of a zebra by telling him that it looks like a striped mule. But if the child has never seen a mule and I have to tell him what a mule is like in terms of a horse, then his notion of zebra is less definite.

It is important, of course, that one acquire meanings. The teacher must realize that the learner acquires them, learns them; this is the only way he can have them. Without meanings, one's world would be queer indeed, his thinking would be practically zero; he would have nothing to think with, for one thinks with meanings. Thinking is essentially going from *this* to *that*, which one cannot do if this for him does not point to or indicate that.

Securing understanding is so important in teaching agriculture that it is discussed separately, as a factor influencing learning, beginning on page 44. Unless one grasps meaning, he fails to understand.

The teacher must be interested in securing meaning and understanding not only because they are desirable learnings, but because learning becomes much more efficient as the meaning and understanding are increased. When other things

are equal, there is perhaps a close correlation between meaning and rate of learning, between meaning and ease of learning, and between meaning and retention of learning. Yet, ignoring this fact, learners are exposed to a great deal of instruction in terms which they do not understand; and the teacher fails to provide for their experiences, which they badly need if the greatest amounts of the most desirable learnings are to be secured.

Observation. Observation is discussed here because of the part it plays in learning, and because of the wide use made of visual aids in teaching. The basis of visual instruction is observation. We use our eyes and ears and other sense organs in making contacts with the outside world. But observing is more than seeing or hearing or feeling or using any or all of the sense organs. It extends beyond mere recognition. Observation involves alertness, exploration, inquiry. It involves directing attention to those elements worthy of attention. Thus it presupposes attention to the elements that are to be observed.

There is no question as to the value of observation in promoting learning. The role of observation in the forming of concepts is significant. Taking a specific concept as an illustration, what had observation to do in developing your concept of horse? To what extent did your sense of sight aid you? Your sense of hearing? Your sense of touch? Your sense of smell? Your kinesthetic sense? A little reflection will show that many of the qualities of horse concept, or of a horse as we perceive it, are not visual qualities. The horse we perceive has weight, degree of softness or hardness, degree of smoothness, temperament, perhaps odor, ability to run, kick, neigh, and pull loads. These qualities have neither form nor color; they are not directly seen, but are *suggested* by what is present to the eye (or other sense organ). The total observa-

tional experience is a compound, made up in part by what is directly gained through sight (assumed in this case) and in part by associations due to previous experiences. Thus observation is more than seeing with the eye (or hearing with the ear). It is over and above sense perception.

If observation were simply seeing with the eye—photographing—or impressing images as a seal is imprinted on wax, people with equally good eyes would observe equally well. Development in ability to observe would then be a matter of maturation—growth of the functions of the sense organs. If observation were merely using a sense organ, we should expect the power of observation to develop parallel with the sensitiveness of the sense organ to stimuli. Gates[3] is the authority for the following statements. "By the age of three, the organs are very nearly as sensitive to stimuli as they will ever be, although it is probable that very gradual growth occurs until a maximum is reached in the late teens. Diligent exercise produces at any one stage some improvement (in sensory abilities), but the limit is soon reached." Notice that Dr. Gates does not say that special practice may not result in greater ability to interpret impressions that the normal person would disregard. *Interpreting* impressions is the heart and center of observation.

The natural desire of human beings to widen their range of acquaintance with persons and things through contact with them is akin to curiosity. People do not desire to observe merely to observe, but to find out something they want to know—sometimes only how it looks or feels or "what's inside" or "what makes it do that," but more often, perhaps, the desire to know represents a felt need. For example, one looks at his watch to find out what time it is, not to see what indicates the hour of six—whether a VI or a 6 or neither. If

[3] Gates, *Psychology for Students of Education*, pp. 91–92.

he learns the time by looking at his watch, noting the other details of the watch is irrelevant.

Strictly speaking, observation is concerned with delving into the unknown; it does not deal with the already mastered or with what one believes to be mastered; it extends beyond the mere recognition of forms and objects. Delving into the unknown implies a desire to find out, questions to be answered, a problem to be solved, something previously hidden that is to be sought for, a possibility of alternative outcomes; it presupposes purpose.

Implications and Suggestions for Method in Teaching. Observation is not an end in itself. It is not only for furnishing raw material to which reflective processes are later to be applied; the reflection should be part of the observing.

The first requirement for effective observation is a clear notion of what is to be observed. In teaching, observation that is not aroused and guided by an idea of the purpose it is to serve is next to worthless. Dewey [4] says, "What often makes observation in schools intellectually ineffective is (more than anything else) that it is carried on without a sense of a problem that it helps define and solve." Dewey also suggests a relation of observing structure and of function, that we should profit by, namely: when one is interested in *function*, in what the object does, there is then a motive for observation of structure. Interest in an activity process passes into noting how the activity is carried on; the interest in *what* is done passes over into an interest in what does it. For example, "It is natural for children to look intently for the *stomata* of a plant after they have learned that, like animals, it breathes, and so must have something corresponding to function in lungs. It is repulsive to attend minutely to them when they are presented for study as mere items of structure, and no

[4] John Dewey, *How We Think*, p. 250.

idea of their action and use is conveyed."[5] Apparently it is generally true that if the learners are not interested in function they will not be interested in observing the structure responsible for the function.

Unaided observation is relatively ineffective in promoting desirable learning in school. How would unaided observation be likely to work on a tractor or on some Duroc gilts or on pasture grasses? It would conserve the tractor (or gilts or other materials), time, and the courage of the pupils were the teacher to guide the process of examination by questioning, suggestions, criticisms, directing attention, where needed, to the discovery of essential facts. Most of us must deal largely with facts already discovered and known by others and therefore need to be aided or guided in our observation.

Objects usually call forth more vivid activity than do pictures (photographs, slides, filmstrips) of the objects. Many teachers who use objects rather effectively in securing observation fail to realize that pictures or other representations should be used in about the same way as the objects, recognizing, of course, the limitations of the pictures. Pictures have their limitations. For example, one cannot determine quality by feeling the skin in the picture of a dairy cow.

The errors in the effective use of pictures seem to be: (1) *The assumption that anyone can read a picture.* Not just anyone can do a good job in observing the object itself. Why assume that one will do a good job in observing the picture of the object, a more difficult thing to do? (2) *The belief that it does not require time to observe a picture.* It takes time to delve into the unknown, to go beyond mere recognition of forms and objects. Perhaps the teacher, without being aware of it, feels that if the camera has photographed, so can the eye. He seems to think that pictures are self-explanatory.

[5] Dewey, *How We Think*, p. 255.

They are not. For one reason or another, pictures are often dealt with very superficially in teaching. Often, too many pictures are used, resulting in "a show." There is likely to be little visual instruction when a picture is simply thrown on the screen.

Motion pictures are usually necessary to teaching only when motion needs to be shown. Even in demonstrating a manipulative procedure, a series of "stills" is often better than a motion picture. In a motion picture the learners tend to give attention to motion, which may make the observing of other things difficult if not impossible. Also, there may not be time to observe a particular thing before it is gone from the screen. Motion pictures may be particularly valuable in giving a general notion or "bird's-eye view" or in developing certain attitudes.

Nobody is a good observer of things in general. One cannot observe effectively in a field in which he lacks information, in a field in which he lacks experience. As we have seen, meaning depends on experience. To the extent that meanings are limited, so is the observation. With limited meanings, stimuli lack prepotency. That a person may learn to observe in a particular field is not questioned. For example, one may learn to observe lumber, or sheep, or tobacco, or soils, or teaching procedure, or football, or what have you. But learning to observe in a given field may have little carry-over to another field. The person who becomes a good observer of football, for example, has become little or no more effective in observing lumber or sheep or tobacco or teaching procedure.

Observation should not take the place of participation in teaching. Often participation experience needs to precede observation or supplements observation at various points. The learner becomes a keener critic and observes more intelligently after some participation experience. He is then in a

better position to interpret what he sees, hears, etc. Interpretation is the essence of observation.

Habit Formation. All habits are learned. They are more or less automatic forms of behavior. They become automatic through being repeated, some of them as automatic as certain forms of innate behavior.

Habits, of course, are not limited to manipulative actions. There are mental habits as well. An attitude or use made of certain information can be a habit as truly as can a muscular act. Any learned behavior evoked with the proper degree of automaticity is a habit. Of very great significance to education is the development of habits as attitudes. A habit as an attitude becomes a disposition or a tendency to act. Thinking habits, of course, are exceedingly important.

There are good habits and bad habits. Good habits increase our freedom, skill, and mastery. They free our energies for other things; they make for uniformity of response, make us stable, predictable. Examples of habits are tying a shoe, making the letters in writing, milking operations, responding to 9×9, becoming angry at things that evoke anger in us. What if one had to "think through" the shoe-tying process each time he tied a shoe, or had to exert the special thought and effort he once did to form each letter, or had to think out each movement of the hand as he milks a cow, or had to ponder the answer to 9×9? In these and all other habits, there is fixity of response or disposition; after sufficient learning, one is able to respond without giving particular thought and consideration to the process. So automatic becomes the response, one may not be aware even that he has responded. For example, he may have to look to see if he has tied his shoe or locked the car door.

Habits are formed through repetition, though not by mere repetition—repetition without variation. Nearly always there is more or less variation in the repetitions. Take, for example, the habit of using "were" with plural subjects. This habit can

be fostered even though the subject varies all the while. Likewise can the habits of giving away to anger or of being friendly or the habits involved in shearing sheep or milking cows be developed. Intensity is a factor in habit formation as in other learning.

In developing habits in learners, the teacher should not lose sight of the principle that as one practices he is drawn toward the ideal or standard of excellence he accepts. Where possible, develop the ideal and the disposition to act before attempting to develop the ways of acting. For example, one should know the kind of an "a" he is to try to make or the kind of sawing job he wants to do before he starts. If the ideal has been accepted, then practice comes in naturally and effectively as a means of attaining the standard of excellence. The standard is a part of the practice. To visualize the ideal is to promote the learning of the mental image. Holding the mental picture or image while executing or attempting to execute it may be an important part of the practice.

Habits and Flexibility. In a habit there is fixity of disposition to respond, a fixity of responses. The disposition or the way of acting is automatic, involuntary. This is the essence of habits. Situations that vary greatly cannot be dealt with effectively by fixed responses. Habits, even when broadly defined, can deal with variations only within restricted limits. For example, shoe laces do not always have to be of the same size or material and the ends do not have to lie the same way in order for one to be able to tie the laces by habit, but one might be "stumped" if he had only half a lace or no lace at all. To the extent that the situation is new, habit will not suffice in dealing with it; there then emerges the demand for thinking. Amid changing conditions, flexibility is required rather than fixed behavior patterns only.

These statements do not mean that habits are not useful. There is need for fixity of disposition to respond and for fixity of ways of responding. Habits do, and should, play an impor-

tant role in human behavior. Even within very adaptive behavior, habits usually operate as elements. This is true in thinking. The whole behavior, however, is flexible, not mechanical, or it would not be adaptive. Habits should be the tool of intelligence.

Habit versus Skill. Habits and skills are not the same thing. Almost any response can be made a habit. It does not follow, however, that the response would be accurate or of good form. The response may be awkward and time-wasting, the product may be crude. For example, one may have fixed habits of cultivating corn but possess low skill in corn cultivation. Habits contribute to skills, but skill carries with it the idea of proficiency, refinement, precision, getting something done in good form in the least time or with the least energy, often gracefully. Skill implies nicety of adjustment to the demands of the situation, however varying the situation; it implies discrimination.

Habits and Knowledge. Knowledge will not in itself secure desirable habits. Health knowledge alone will not change health habits, a study of nutrition will not in itself result in better eating habits, nor will teaching about farm record keeping produce habits in record keeping. Often the results from such instruction are far from gratifying. Habits are formed through repetitive *action*, not through knowing about. They are ways of acting that have been acquired through practice. In forming a habit, a situation must produce activity; then what has been done must be repeated, usually many times, before a habit is formed. Knowledge contributes to habit formation only through influencing what is done—through influencing the activity, the acts, usually in their natural setting.

Habits Certain to Be Formed. The teacher should recognize that habits will be formed—good habits, bad habits, or habits in between. Enough practice forms a habit. The young man

is forming habits in the planning of his farm business; the boy is forming habits in the making of entries in his record book; both are forming habits in politeness, cooperation, and thinking. In the words of John Dewey: [6]

> *In any case positive habits are being formed:* If not habits of careful looking into things, then habits of hasty, heedless, impatient glancing over the surface; if not habits of consecutively following up the suggestions that occur, then habits of haphazard, grasshopper-like guessing; if not habits of suspending judgment till inferences have been tested by the examination of evidence, then habits of credulity alternating with flippant incredulity, belief or unbelief being based, in either case, upon whim, emotion, or accidental circumstances. The only way to achieve traits of carefulness, thoroughness, and continuity is by exercising these traits from the beginning, and by seeing to it that conditions call for their exercise.

Some Factors Influencing Learning

We cannot discuss here all the factors that influence learning. A few factors are singled out for consideration. They are goals or objectives, level of aspiration, knowledge of success and error, understanding, age of the learner, and capacity to learn.

Goals or Objectives. A goal or objective implies foresight of the results expected to be attained. It is not just a wish or a belief that the results are desirable, without intention to act on the belief; one does not have a goal which he does not intend to reach through action. The goal is a determiner of action, a determiner of the activities to engage in to reach the goal. It is also a determiner of what will be satisfying and what will be annoying.

Definite goals or objectives on the part of teachers and learners are necessary to a knowledge of results and to ob-

[6] John Dewey, *How We Think*, p. 89. Italics in the original.

serving the progress made. Knowledge of the progress that is being made toward a goal which one has constitutes a reward. To the extent that the desire to attain the goal is strong, the knowledge of the progress tends to be satisfying. There is motivational gain in having a goal, even if the learners fail to reach it. Also, the seeing of functional relationships is increased by having a goal, and there is more likelihood of good organization of subject matter.

Teachers should realize the desirability of worthy goals or objectives on the part of the learners, whether they be learning goals or goals of some other kind. The teacher, of course, must have teaching goals or objectives, since teaching implies a contemplated product in learning. The learners are not likely to have worthy goals or objectives unless the teacher has. It is folly to expect them to have.

Elsewhere is mentioned the relation that exists between one's goal and the standard of perfection he accepts. If one's standard of perfection has already been attained, goal of attainment no longer exists. If I grow corn or shear sheep as well as I care to, I shall not be determined to improve my corn growing or sheep shearing.

There are other relationships between objectives and teaching-learning which must not be overlooked. It is largely through learning that desires, wishes, goals, purposes, and objectives are formed. One of the important purposes of education is to help learners have worthy goals and objectives—help provide the *needs* for learning. The teacher has a responsibility in determining the objectives the learners will have.

So important are the teaching objectives that the next chapter is devoted to this subject.

Level of Aspiration. The level of aspiration is the performance level or future attainment that the person sets himself to reach in some task. He *aspires* to reach this level and feels

that he can and will reach it. So it constitutes a kind of a goal for him. People often have quite definite notions of how well they can, should, and will learn to perform, and they regulate their performance and their feelings of satisfaction or annoyance in keeping with these notions or levels.

Success and failure, therefore satisfaction and annoyance, are related to the level of aspiration. What would be regarded as successful performance by one person may not be regarded as such by another. One's expectation should be in keeping with his powers of attainment. Able pupils should not be permitted to set goals far below their ability, and mediocre pupils should not be encouraged to set for themselves levels they cannot attain.

Apparently one's level of aspiration tends to gravitate toward his achievement. It has been observed that, after success, the level of aspiration is likely to be raised, and, after failure, lowered.

It is the business of a teacher to help the learners have the levels of aspiration they should have. Teachers can do a great deal in developing ideals of workmanship and in guiding learners in developing levels of aspiration consistent with their abilities.

Knowledge of Success and Error. Knowledge of success and error is significant only with reference to one's goal—what one wants to do, where he wants to go or be, etc. In the absence of a goal or objective one response is as good as another; results are not important. Without a goal, there is no success to be satisfying or error to be annoying.

Success in a motivated activity brings reward; failure brings annoyingness. Knowledge of results is necessary for an awareness of success and failure. It defines them, makes their consequences possible, necessitates the selection and elimination of the appropriate and the wrong responses, and helps determine where additional practice is needed.

Practice is futile in the absence of a knowledge of results in practice. Learning is not promoted by shooting at a target without knowing the results or by attempting to draw 4-inch lines without knowing whether the lines drawn are good, poor, a little short, too long, and so on. Almost any device that furnishes the learner with a progressive knowledge of results in practice tends to promote his learning. In the absence of such devices, the practice is likely to be "mere repetition" (see page 13).

An implication of this factor for the teacher is the necessity for his knowing the character of good performance and for the learner to desire to perform effectively. If improvement in performance is to be secured, it should be desired by the learner.

Understanding. Understanding by the learners is a factor influencing their learning. Understandings are also important learnings. Understanding a thing consists largely in seeing why it is true. One cannot see why a thing is true unless he sees its relation to other knowledge which he already possesses.

The quality of much of our learning depends on the degree of understanding. In a very true sense, learning may not be acquired in the absence of understanding. Nothing is really known unless it is understood. We have seen how practice affects learning. Ability to apply or use knowledge in new situations depends largely on how well it is understood. The use or nonuse of the knowledge, in turn, promotes or hinders learning.

Over and over we are made to realize the part that seeing relationships plays in learning. Seeing "why a thing is true" leans very heavily on grasping the relationships of cause and effect. Seeing relationships tends to make learning easy. When one tries to learn without seeing relationships, he usually resorts to memorization, a difficult and uninteresting task. His

schoolwork may then become something he would like to be delivered from.

Understanding is closely related to thinking, the seeing of relationships. Learners come to understand as a result of the thinking they do. Understanding, in turn, increases the amount and quality of thinking.

If the teacher would secure understanding by the learners, he must make a special and sustained effort to secure it, not leave it to be developed incidentally. Application of knowledge is not enough to secure understanding. Rather, understanding of a truth comes from *seeing its relation to other knowledge*, particularly that which explains it. One does not grasp knowledge merely by applying it. The application of a truth may reveal nothing as to why it is true. For example, one may use Bordeaux mixture or one of the "fixed coppers" on potatoes year after year with almost no understanding.

Teachers of agriculture often fail to develop understanding in the learners. Some teachers seem to be satisfied with a "prescription" type of teaching–dealing only with what to do and how. Here are some questions the writer of this book asked a few years ago, and the selected answers as given by boys who had had two or more years of agriculture in high school:

What is protein? "It contains potash and something."

For what is protein used in the body? "It is used to build bone." When asked then if a mature cow giving milk would need protein, a boy answered, "No."

Why do laying hens need protein? "To make the shell of the egg."

Why will pulling leaves from the stalks of corn decrease the yield of grain? "Cells in the leaves take nitrogen from the air."

Why inoculate legumes? "So that they will sprout."
How do worms get into apples? "Bees carry the germs."

These answers illustrate a lack of understanding by the boys of some of the elemental things one should know in agriculture.

Age of the Learner. People of nearly all ages receive instruction in agriculture. There is much misunderstanding of age as a factor influencing learning. Childhood is often looked on as *the* learning period. Many people have thought that adults, somehow, could learn only with difficulty if at all. The facts are that general ability to learn develops gradually from birth to maturity, that older children learn more quickly and retain better than younger children, that learning ability decreases only very gradually after maturity until one is perhaps 55 or 60 years old, then somewhat faster. These facts are shown in the accompanying figure.

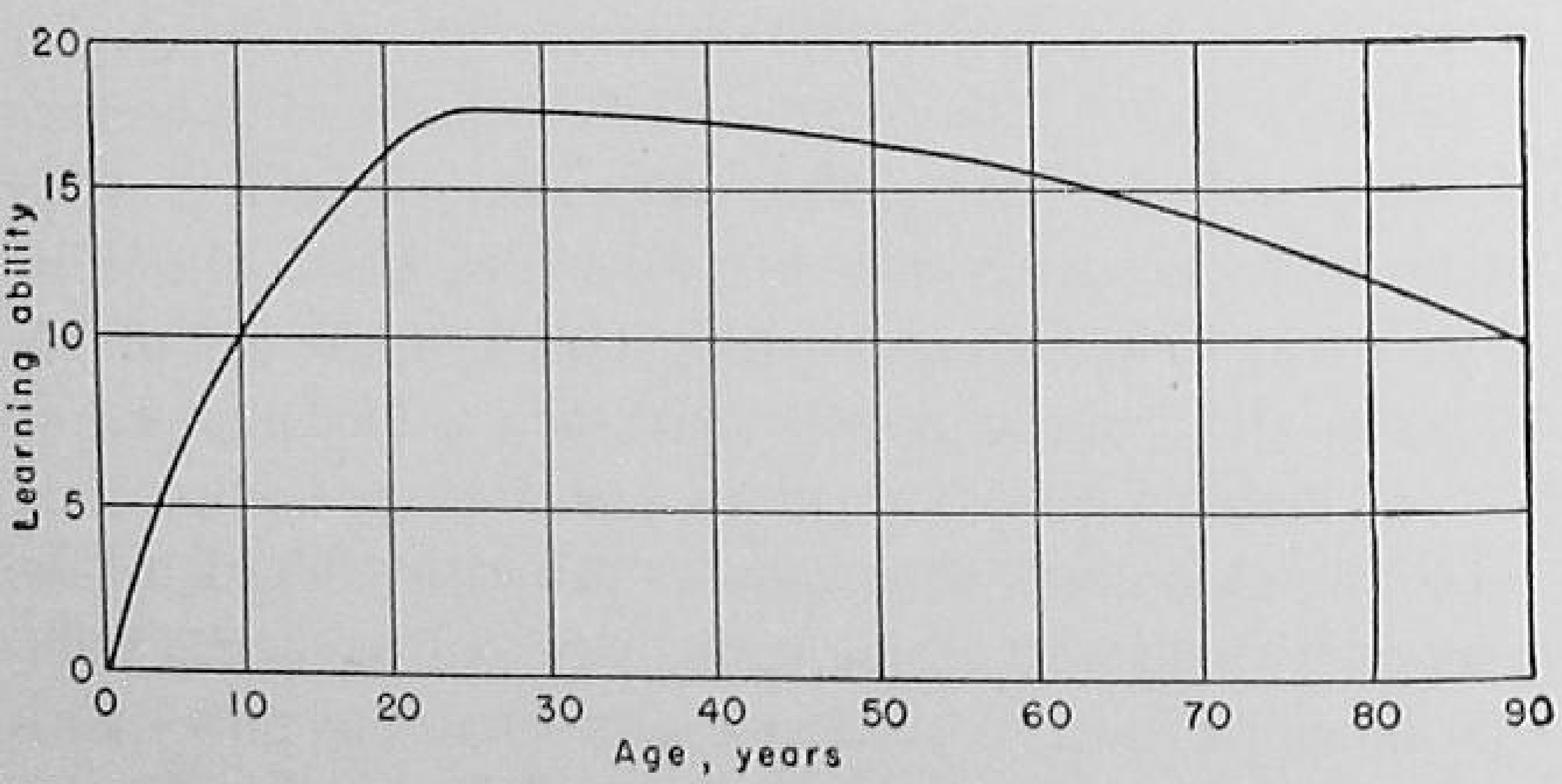

FIG. 3. Age and general learning ability. (*Adapted from A. R. Gilliland, Genetic Psychology, Ronald.*)

Childhood Learning. The child cannot learn most things as fast as the adult. Some of the reasons are: he is unable to concentrate for so long a time; he is lacking in experience,

and fails to see many and significant relationships; he seldom has as much incentive to learn as the adult; for many things he is physically immature; and his method of learning is usually uneconomical.

Adolescence. The close relation between maturation and adolescence is evident. Adolescence is the period of achieving adulthood. It usually begins at about the thirteenth or fourteenth year in girls and a year or so later in boys. There is much variation as to the age of beginning, however. Adolescence extends to maturity. Thus, adolescence is the period between childhood and adulthood. There is no significant change in intellectual growth at some particular stage, as before, during, or at the end of adolescence. All changes are very gradual.

The choice of a vocation is typically a choice of adolescence—of the decade between 15 and 25 years. Vocational choice, vocational participation, and vocational preparation present a host of problems for the adolescent and those responsible for his guidance and direction.

Adult Learning. Adult learning is of concern to us because of the attention given to adult education, and because all of us are or expect to be adults. Adults must learn. The story is told that Cato started to study Greek at the age of 80. Someone asked him why he started such a difficult study at such an age. "What other age have I?" was the reply.

Education is a continuous process. An early education does not provide one with all the knowledges, attitudes, and skills he will need for life. So important is the subject of adult learning that whole books are written on it. It was with Thorndike's book [7] in 1928 that a truly vital faith in adult learning came into being. This faith stands out in the statement: "In general, nobody under 45 should restrain himself from trying

[7] Thorndike, *Adult Learning*, The Macmillan Company, 1928, p. 177.

to learn anything because of a belief or fear that he is too old to be able to learn it. . . . If he fails in learning it, inability due directly to age will vary rarely, if ever, be the reason." Thus it would seem, as someone has said, that the old dog can learn new tricks if he is not too well satisfied with the tricks he already knows.

Other conclusions of Thorndike's are about as follows:

1. There is a rather rapid rise in the ability to learn, slowing up somewhat as maturity is neared and reaching its height about the age of 22 to 25 (see Fig. 3, page 46).

2. After the climax is reached, there is a gradual decline in learning ability, but the decline is so gradual that at 45 one is still as capable of learning as he was at the age of 18 or 20, and more capable than when he was 15 or 16 years old (see graph).

3. Actual loss of the ability to learn such things as adults commonly have occasion to learn is considerably less than that shown from all experiments grouped together for all kinds of learning.

Two factors determine the learning power of an individual at any one time. The first factor is the learning mechanisms and their maturity—the brain, the sense organs, the motor organs, and so on. The second factor is the accumulation of experience and other learning. As the first factor begins to decline, the second factor becomes increasingly more important. This probably explains why learning ability stays at such an even level for so many years.

The question is often raised as to whether the relations that exist between age and rate of learning in later life may be a function of the extent to which people have kept in practice at learning. Thorndike[8] concluded that continued practice at learning is "probably a partial preventive or cure for adult

[8] Thorndike, *Adult Learning*, p. 146.

inability to learn." This conclusion has been supported by later studies. Continued practice in learning may serve to maintain one's ability to learn into the later years of life, above what it would otherwise be. This is an encouraging statement for the teacher himself.

Capacity to Learn. Capacity refers to power to learn—to be changed in behavior through one's own activity. Heredity provides the basic materials for all processes in people, including the learning process. It is clear, even to a casual observer, that capacity to learn is a factor influencing learning.

People are different from one another in capacity to learn, as in all other respects. This fact is in keeping with common observation, though frequently overlooked by teachers. Pupils in the highest 25 per cent of a group probably learn more from one hour of study than the pupils in the lowest 25 per cent from three or four hours of study.

We have no way of measuring capacity directly. We can only measure what has been learned and *infer* capacity, that is, infer that one has learned according to his ability to learn. However, opportunity to learn may influence the learning. What people have thought was innate intelligence depends at least somewhat on opportunity to learn.

Distribution of Capacity. There are people exceedingly low in learning ability, people exceedingly high, and people in between. No sharp differentiations exist among the levels of intelligence. Any division between one level and another is purely arbitrary, as for example a division between short people and tall people or between tall people and very tall people.

The distribution of capacity or power to learn tends to conform to the "normal curve of distribution," a normal curve being shown in the accompanying figure. Normal or average capacity in the figure is made to include the middle 60 per cent of the cases. We might think of normal as including the

middle 50 per cent or the middle 33⅓ or some other part of the whole. Whatever "normal" may include, it refers to a kind of middle average. Most people are normal or near the normal in intelligence. Relatively few are very far from the

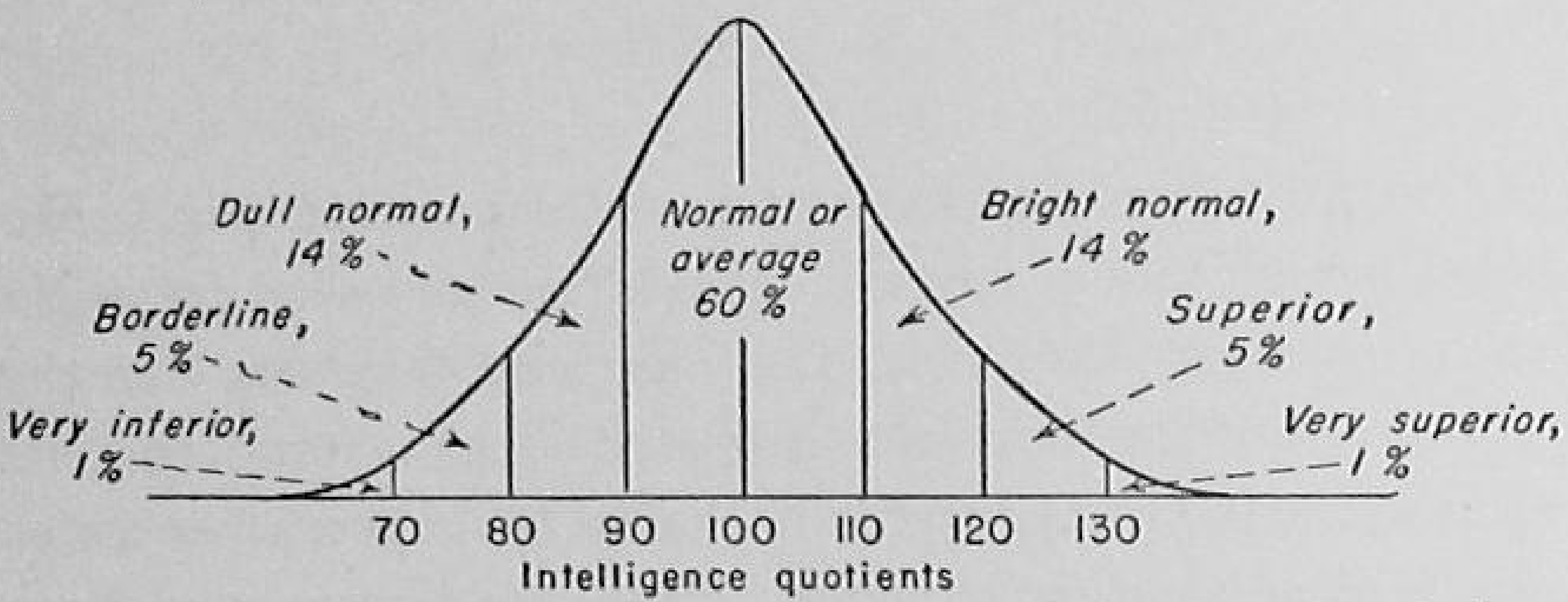

Fig. 4. Distribution of capacity or brightness. (*Sorenson, Psychology in Education, McGraw-Hill Book Company, Inc.*)

normal. If 60 per cent of the population is considered to be of normal brightness, then 20 per cent is above normal, and 20 per cent is below normal—the dull normal, borderline, and feeble-minded. By this grouping, 80 per cent of the population is normal or above normal in power to learn.

CHAPTER 3

THE TEACHING OBJECTIVES

The part that objectives or goals play in learning is, we hope, made clear in Chap. 2. The learner must have them in acquiring most learnings. They are also necessary for the teacher; teaching implies a proposed learning product. One cannot teach, strictly speaking, unless he knows what learning he is attempting to secure. Thus, the teacher *must* have teaching objectives—stated or not, and if stated, in whatever terms they may be. The lack of clear and valid objectives is probably more responsible for poor teaching than any other single factor. Following the observation of a teacher at work, one of the most common questions raised by him is, "How am I doing?" Too often the observer must answer with the question, "What are you *trying* to do?"

Determining the teaching objectives is perhaps the most fundamental of all the processes involved in education. Without teaching objectives, the teacher cannot know what to teach; nor can he, day by day or at the end of any period of time, judge his progress in teaching or that of the learners in learning as a result of the teaching. Method in teaching is meaningless except as governed by forecast of a result desired. The teacher cannot proceed intelligently if he does not see the relation of the process of learning to the object he seeks.

The teacher is a producer. Any producer must know what changes he expects to bring about in the materials he works on. He must know what his product is to be, what it is to be like. For example, the producer of hammer handles must have a clear notion of what he is going to produce before he begins

to plan for the production. He is going to produce hammer handles, not glass bowls or screw drivers. The business of the teacher is to bring about desirable changes in the behavior of the learners. These changes are his products. Teaching or any other production implies a foreseen, intended product, not by-products that may possibly be worth something. The by-products in teaching may be important and should not be lost sight of. When they become contemplated products, however, they are no longer by-products.

Meaning of "Objective." An object is the end aimed at. An objective, in a military sense, is the purpose for which or place to which the movement of an army is directed (also called objective point). The term has a similar use in education. An objective is the aim of one's exertions. Objectives are to be attained, reached. One who has an objective thinks he can reach it and he intends or aims to do so. Else why have it? One never has an objective that he does not expect and mean to reach. Otherwise it would not be *his* objective.

A teaching objective represents a learning or learnings to be secured—a change or changes to be brought about in the behavior of the learners. Thus it will be a change in knowing behavior, doing behavior, or feeling behavior, or some combination of the three. (Other terms, stressing the product rather than the process, are knowledges, abilities, and attitudes.) These facts are exceedingly important for the teacher to grasp. There is a vast difference between the teacher's having as his objective the development of the ability to brood chickens, for example, and having pupils read a certain chapter or certain pages in a book or bulletin or study a unit. There is likewise a vast difference between having teaching objectives and believing that what the learners or the school "gets done" or "gets made" is the goal of teaching. The goal of teaching is *learning*. Teaching objectives represent nothing more or

less than the learnings to be secured as a result of the teaching. Without them one does not teach.

The teacher may have justifiable objectives other than teaching objectives. Any goals of accomplishment—physical improvements to be made in the classroom, number of dairy heifers to be procured, or number of acres of alfalfa to be seeded, for example—may be considered objectives. But let us not confuse these with teaching objectives; they are not learnings to be secured.

Stating an Objective. The nature of the teaching objectives, or the terms in which they should be expressed, involves not a little educational philosophy. Just what and which learnings are to be secured is a matter of philosophy. If only knowledge is to be learned, then those knowledges that are to be acquired by the learners become the teaching objectives. It is questionable, however, whether knowledge alone is often a proper objective in teaching agriculture or any other subject. We must go beyond knowledge if our teaching is to be of the greatest value. This does not mean that our students are not to acquire knowledge, but that, in general, the knowledge should contribute to doing behavior or to feeling behavior or at least to other knowledge which will in turn contribute to doing behavior or feeling behavior. Knowledge for its own sake cannot be justified. Seldom, if ever, should knowledge be taught if the knowledge does not, directly or indirectly, help the learners become able to do something they will need to do or does not contribute to the development of a desirable attitude toward or about something.

Teaching objectives may be stated in different ways. In the 1940 report of the national committee on objectives in vocational education in agriculture, objectives are stated in terms of *effective ability to*. For example, a teaching objective might be: To develop the effective ability to feed dairy cows in production. The term "effective ability," as here used, in-

cludes the attitudes and knowledges or understanding that will be needed in making the ability an effective one. Other people have stated their objectives in terms of only *ability to*, contending that effectiveness of the ability is implied and therefore not necessary in the statement. Still other people have used the expression *ability and attitude necessary to* in stating teaching objectives. For example, their phrasing might be: To develop the ability and attitude necessary to feed dairy cows in production. These people say that one's attitude—how he feels toward or looks upon a thing—is too important not to list along with the ability or as a separate objective. Some people do not use either of the above expressions in stating objectives. Here is an illustration: "Testing milk for fat content. Each member is to repeat the tests until his duplicate tests vary less than 0.2 per cent and no evidence of burning occurs."

Use the terminology you prefer; but have specific, clear, justifiable, attainable, teaching objectives. Without them your teaching is not likely to get you anywhere or to be fascinating work. If you have such objectives and devote yourself wholeheartedly to attaining them, your students will gain far more than students who merely learn and recite lessons and take examinations or information tests.

If you are to have good teaching objectives, you will need to decide on how you will state them and you will need some standards to use in setting them up.

Good Teaching Objectives. There are certain characteristics or qualities of good teaching objectives, regardless of the terminology used in stating the objectives. Here are some of them:

1. Objectives should be stated in terms of life activities (life outside of school).

2. Each objective should represent a change to be brought about in behavior.
3. Objectives should be clear and definite in statement or by description, and be stated in sufficient detail to serve as a basis for selection of subject matter.
4. Objectives should be attainable (with the time and facilities that may be used).
5. Each objective should be relatively the most important and significant to attain.
6. Each objective, when reached, should contribute to attaining the aim of the course (or, if not a course, other educational aim).
7. The smaller objectives should be derived from the larger objectives, just as the large objectives in turn get their sanction from the still larger aim.
8. The teacher can know when he has reached the objective. (It should be possible to evaluate the attainment of the objective.)
9. Each teaching objective should definitely imply a corresponding learner's goal. (It is very important that learners have objectives too.)
10. Objectives should belong to the course so that anyone may know what the objectives of the course are.

Determining the Objectives. Teachers should get their cues for their teaching objectives from real-life activities—from what people do outside of school—or from their educational aim or aims, which should be to meet a need in life. Teachers of vocational agriculture must get their cues from the real-life activities of the farming vocation for which their students are in training. The weaknesses existing in the farming practices and standards of the community are one source of suggestions for the objectives. Teachers will find other suggestions, particularly for boys and young men, in the difficulties

met in attaining proficiency in the farming vocation whether or not these represent prevailing weaknesses in adult practices. Youngsters need help in meeting their difficulties. They also need help in speeding up the acquirement of the essentials to success. Teachers may get suggestions from ready-made lists of objectives, but they should not accept these too readily as their objectives; slavish acceptance of dictated ends has no place in democratic education. Teachers may get ideas or suggestions from job analyses or from writings on technical agriculture, but neither of these yields teaching objectives directly. Teaching objectives represent the learnings the teacher intends to secure in the learners. They represent decisions made by him who has the objectives. Determining the objectives requires intelligence.

The teacher cannot attain all possible worth-while objectives. His is the exceedingly important undertaking of deciding on the objectives that are relatively most important and significant to attain. The teacher of vocational agriculture must consider not only the aim of his course, the weaknesses in the farming practices and standards, and the difficulties met in attaining proficiency in farming, but such factors as these: (1) the age and previous learning of the students, (2) the amount of time to be devoted to the subject, (3) the library, equipment, and other resources to be used, (4) opportunity for practice by the learners, (5) his own proficiency in teaching so as to attain the objectives. Teachers of agriculture other than vocational agriculture must also consider similar things. All teachers must give special consideration to the educational aim or aims of their course in deciding on their teaching objectives. Valid objectives for a high-school course in general agriculture are not the objectives for a course in vocational agriculture. Valid objectives for prevocational agriculture should, when attained, accomplish the aim or aims of prevocational agriculture. The objectives for a college course in farm

management should be in keeping with the aim of the course, and so on. All teachers, however, should give due consideration to real-life activities in setting up their objectives.

It is convenient and well, in deciding on the teaching objectives, to decide first on the large objectives after being clear on one's aim in the course; then decide on the smaller objectives each of which, when attained, will contribute to the larger compound of change in behavior. When a man builds a barn, he normally starts with a conception of a barn as a whole, not with the driveway in the barn, the roof, the doors, the stalls, the loft, the feed troughs, mangers, hay chutes, and the like, which later have to be considered. Each of these things, of course, contributes to the total barn, and the barn is the sum of its parts. However, the parts are not decided on separately and independently of the conception of the whole barn. The barn requires the parts. Each part has to be planned and constructed to fit into the total pattern and built with tools and skills appropriate to the purpose.

To illustrate the application of these various ideas and standards, there follows the statement of a rather large teaching objective in vocational agriculture that might be appropriately attained by high-school boys in a tobacco-growing community, together with a breakdown of the large objective into smaller possible objectives. (Of course, the parenthetical statements and explanations would not ordinarily be included, as they would not be needed.) Two ways of listing the smaller, more specific objectives are shown, the same large objective being used in both. It is not held that either illustration is perfect or that these are the only ways to list the learnings to be secured.

LARGE OBJECTIVE: To develop the effective ability to fertilize tobacco. (Note: This does not include building up land for growing tobacco.)

Smaller abilities to be acquired (which constitute smaller objectives):

1. To determine the kind and amount of fertilizers to apply
   a. To judge the fertility of the land in terms of corn yield (since fertilizer recommendations are made in terms of corn yield)
   b. To detect plant-nutrient deficiencies
   c. To interpret the recommendations of the college of agriculture
2. To apply the fertilizers (method of applying)
   a. To apply fertilizers by broadcasting
   b. To apply fertilizers in the row
   c. To apply fertilizers in "bands" at time of setting
   d. To side-dress tobacco
3. To buy fertilizers intelligently
   a. To interpret a fertilizer tag
   b. To calculate the cost of the plant nutrients
4. To interpret simple experimental data on fertilizing tobacco (such as appear in publications for farmers)

Attitudes to be developed (which likewise are smaller objectives and contribute to the attainment of the large objective, to develop the effective ability to fertilize tobacco):

1. The feeling that good crop yield usually means economical production
2. That it ordinarily pays to fertilize tobacco, if done in the right way
3. The desire to produce a good yield of quality tobacco
4. Pride in doing a good job of fertilizing
5. That there is much to be known about fertilizing tobacco
6. The conviction that brand names in fertilizers may mean nothing

7. The desire to understand fertilizing tobacco
8. Realization that not all is known about fertilizing tobacco

Knowledges to be learned (which may constitute teaching objectives. These knowledges should contribute to the abilities and attitudes listed):

1. How plants take in nutrients
2. The necessary plant nutrients—what they are
3. Concept of "limiting plant nutrient"
4. The limiting nutrients in the region
5. Indications of deficiencies in each of these nutrients
6. How lime is related to fertilizing tobacco
7. How the use of animal manure is related to using commercial fertilizers
8. Why fertilizer alone will not produce quality tobacco
9. Effect of fertilizer on the quality of tobacco
10. Relation of yield to profit
11. Meaning of terms on fertilizer tag
12. Where to find reliable information on fertilizing tobacco.

You may not care to list separately the three groupings of objectives. Doing so has the advantage of recognizing each learning more specifically, but it may seem rather cumbersome to make the triple list. All three forms of behavior—abilities, attitudes, and knowledges—influence each other and are not entirely separate. So, in practice, many people make only one list of the smaller objectives, as illustrated below. In reading, precede each item by "To develop the effective ability to." For example, item 7 would read: "To develop the effective ability to determine the kind and amount of fertilizer to apply." Item 7*a* would read: "To develop the effective ability to judge the fertility of land in terms of corn yield."

LARGE OBJECTIVE: To develop the effective ability to fertilize tobacco.

Smaller objectives: To develop the effective ability to

1. Want to produce a good yield of tobacco
2. Believe that tobacco should be fertilized
3. Feel that one can do a good job of fertilizing tobacco
4. Understand how plants take in their nutrients
5. Understand the meaning of "limiting plant nutrient"
6. Understand the relation of lime to fertilizing tobacco
7. Determine the kind and amount of fertilizer to apply
   a. Judge the fertility of land in terms of corn yield
   b. Detect plant-nutrient deficiencies
   c. Interpret the recommendations of the college of agriculture
8. Apply the fertilizers
   a. Apply fertilizers by broadcasting
   b. Apply fertilizers in the row
   c. Apply fertilizers in "bands" at time of setting
   d. Side-dress tobacco
9. Buy the fertilizers intelligently
   a. Interpret a fertilizer tag
   b. Calculate the cost of the plant nutrients
10. Interpret simple experimental data on fertilizing tobacco

In this second illustration some of the attitudes and knowledges listed in the first illustration have been dropped, not because they would not be learned but because learning them would seem to be implied in attaining the objectives in the second list. Also, in the second illustration, the term effective ability is "stretched" somewhat so as to include the three forms of behavior in a single list.

Certain very pertinent questions may be raised about some of the statements in both lists of objectives. One such question

is the extent to which each statement is clear and definite so that one may know the degree of attainment or proficiency intended. Obviously the more definite the statement, the clearer the objective is likely to be. The teacher cannot be too clear on his teaching objectives. He may, however, be too unwilling to change his objective or fail to see the need for doing so when the situation warrants a change.

Preparing the Objectives. The first thing that may well be done in preparing the objectives is to decide on the important abilities that are to be developed in the learners as a result of the course. This decision will throw much light on the attitudes and knowledges or understandings that should be developed. These latter types of objectives may then be included in the statement of objectives if they are not so obvious as not to need listing. Following this procedure should not minimize the importance of attitudes or knowledges. It should, however, relate them to the abilities, since most of them ought to be. Attitudes, to be functional, must find expression in satisfying activity. Perhaps the same thing can be said for knowledges. The worth-while information to be learned will contribute, directly or indirectly, to the development of either attitudes or abilities or to both.

In preparing the teaching objectives in agriculture, the "calling" aspect of farming should not be lost sight of. It is important to recognize that there are many desirable objectives in agricultural education which contribute little or nothing to productive efficiency—even in vocational agriculture. In this category are those things that may add to satisfaction in farming and rural life. Attitudes and knowledges or understandings often serve this purpose. The matter of beauty should not be overlooked. To find beauty or to create it on the farm may count a great deal toward making farming a calling. Intangible values are exceedingly important in farming because farming is a mode of life, as discussed in Chap. 1.

Relation of Objectives to "Units." Courses of study are sometimes set up on the basis of units as divisions of subject matter. There can be no objection to this if the teacher clearly understands that the units, as the term is ordinarily used, do not give him his teaching objectives. They indicate areas of work only; they do not fulfill the meaning of objectives. Before or after the units are decided on, the objectives must be determined. If they are not determined, the teacher proceeds blindly.

The fact should not be overlooked that teaching objectives constitute a kind of unit. For example, if the teacher's objective is to develop the effective ability to feed growing pigs, this is a teaching unit, though it is not usually called a unit.

CHAPTER 4

CONSTRUCTING A COURSE OF STUDY

A course of study is here regarded as the kind, amount, and organization of content in any systematic offering in agriculture. Content is the design for attaining the objectives. The objectives together with the content make clear what is to be taught. What to teach is the most baffling problem in agricultural education, or perhaps in any other kind of education. In deciding what to teach, the teacher is forced to consider relative essentialness of the learnings to be secured and when they are to be secured; he must determine the specific learnings he intends to bring about. To know definitely *what* to teach is to go a long way toward knowing *how* to teach it. Half the battle of method has been won when the teacher knows just what he seeks to accomplish. "Organization of content," in the opening statement, assumes a consideration of the amount of time to be used and when it is to be used. So the course of study embodies the teaching objectives, approximate time assignments, and the selected content which may include even the means and method to be used in the teaching.

A ship follows a course. In doing so, the captain expects to reach the port to which he starts, and all the passengers with him. Likewise, the teacher should have a course. Both the captain and the teacher may need to change their courses to meet situations that arise. They may need to follow a different course this year from that followed in years gone by. But this is no argument against having a course. The course should

be changed when there is need for change; change is not something to be resisted.

It is rather generally agreed that the responsibility for course building should rest largely with the teacher. He may get suggestions from outlines or from any people competent to give them, but he himself must finally prepare the course to fit his own views and abilities and to meet the needs of those who will take it.

Major Factors to Consider

In planning or constructing a course of study, the teacher should be guided by five major factors: (1) the purpose for which the course is to be offered, its aim, (2) the characteristics and needs of those who are to take the course, (3) the educative environment of these persons, (4) sources of information available, (5) the requirements or demands of the vocation or other uses to which the learning is to be put. These factors are not wholly separate and may not need to be considered in this serial order.

Purpose of the Course. The first requirement for constructing a course is to have a clear conception of the purpose of that course. A course should enable the teacher to accomplish his aim or purpose. In the absence of purpose, one has nothing to guide him in deciding on course content. Purposes of agricultural education were discussed in Chap. 1, under the heading of Aims and Functions of Agricultural Education. A course, ordinarily being part of a curriculum, is designed to meet the needs of a clearly differentiated group of students. The ship is destined for a port. Only those should be on the ship who are to go to that port. Boys taking vocational agriculture should be in preparation for a farming vocation. Pupils in prevocational agriculture are not yet in preparation for a vocation. The high-school course in general agriculture is

not supposed to lead to a vocational-training port. The adult-farmer course has its own port.

These statements do not imply that the course is to be worked out and then the students fitted to it. The learners and their needs are a central factor in course building. They determine whether such a course should be offered as well as what the particular objectives and content should be. But unless there can be common purposes or aims and some characteristics and needs in common, no course is possible for a group of learners.

Characteristics and Needs of the Students. There is no justification for a course that does not meet the needs of the students. The course is *for* the students. Until we consider them and their needs we do not know whether certain learnings can be secured, nor do we know whether they should be. Apparently, all teachers give some attention to this factor in constructing their courses of study. Evidences are such questions as: What shall I teach the freshmen? Should this come in the senior year? Is this material too technical for adult farmers? But we can give vastly more attention to the characteristics and needs of the learners than some of us have given.

The age of the learner and capacity to learn are discussed in Chap. 2. These, of course, we need to consider for our group or groups of students. We must also consider the knowledges, abilities, and attitudes the learners possess—their schooling and farm experience, what they are interested in or can be caused to be interested in, and the like. These things affect the course of study. Then, at any time, we may need to modify predetermined content to meet the needs of part of the class, or of the entire class, with respect to one or more of the things named.

Vocational training must take capacity into account—both before the training, and as the training progresses. Certain learners are incapable of profiting by the experiences designed

for them in a course set up in accordance with other sound criteria. If such failures occur below the line of minimum requirements for the vocation, these learners must be rejected and started in something in which they can succeed.

The matter of previous school learnings has several angles for the course builder in agriculture aside from their being an index of capacity to learn. In most courses we assume that the student can read and write and that he has acquired the elementary skills in arithmetic such as subtracting, multiplying, dividing, pointing off decimals, figuring percentage, dealing with common fractions, and using ordinary weights and measures. Obviously, such abilities or the lack of them conditions what can be taught in agriculture and the method of teaching. Also, if these things are not fairly well mastered, they become properly a part of the content of the agriculture course in so far as they contribute directly to accomplishing the course aims. In a vocational course, for example, they become properly a part of the course in so far as they contribute to vocational success. The same general line of reasoning holds for selected portions of the sciences that have a bearing on solving the problems in agriculture.

Needs and desires are not the same thing. The educational needs of the learners are derived largely from the situations that life will present in which the learning will be used, to the benefit of the learner and, usually, society.

Educative Environment. The community in which the teacher works sets the educative environment through which he must work. Educative environment, as the expression is here used, includes all the surroundings or conditions external to the learners that influence their learning. The environment is much more than the crop and animal enterprises of the community. The schoolrooms, equipment, library, daily and yearly schedule, total curriculum offerings and their quality, and the farms with their equipment, livestock, and practices, are all

part of the educative environment. Farm-family relationships are a part of the educative environment, as are community relationships and even the season of the year in which the learning may take place. The soil, degree of success in farming, quality of farm life, and the like are a part of the environment. Obviously, the practice the learners are to get in agriculture must be where the learners are, and to a great extent, with what the learners have. The part practice plays in learning is discussed, briefly, in Chap. 2, pages 13 to 14. The necessity for practice is further discussed in Chap. 8 on Supervised Practice, pages 165 to 166. Educative environment conditions what the teacher shall teach and how he shall teach it. It particularly conditions the practice the learners will get—in their farming programs, in the farm shop, on field trips, etc.

From the standpoint of high-school or regional courses in vocational agriculture, research studies point to the fact that nearly all the boys who become farmers farm in the region in which they grow up. This is indeed fortunate for the teacher in planning his course of study. He does not have to prepare the boys and young men for farming in faraway communities; his is not the impossible task of training for farming which the students cannot practice. The best possible training the teacher can give the few boys who may farm elsewhere is to make them proficient farmers in the local community.

Because the educative environment in which the teacher works sets the environment through which he must work, many of the facts gathered to throw light on the requirements of the vocation will also throw light on the educative environment. This is also fortunate for the teacher in building his course of study.

Sources of Information Available. Teachers of agriculture should have the soundest possible basis for the agriculture they teach. Sources of information useful in deciding on the

farm practices that should be followed and therefore taught, are:

1. Results of experimentation and research
2. Results from carefully conducted trials and demonstrations, from studies of farmers' records, and the like
3. Opinions of authorities based on their observations and their knowledge of scientific principles
4. Practices used by good farmers but which lack confirmation from a more reliable source

The highest order of agricultural information, and therefore the most reliable basis for farming practices, is the results of experiments and other agricultural research conducted by trained research workers. The purpose of research is to find the truth. Research in agriculture and related fields is the foundation of all agricultural progress. Teachers of agriculture should use the results from research as a basis for their teaching whenever such results are available and applicable to the situation. Persons who lack respect for research should not teach agriculture.

Many demonstrations or trials are conducted to test or prove the application of experimental results to local or field conditions. Whenever such work is carefully done, the results are a reliable source of agricultural information. Comparable to the results of demonstration are the results from studies of farmers' records. These records may be especially helpful in studying the effectiveness of different practices. Information obtained from studies of records of a dairy herd improvement association, poultry demonstration flocks, and the like may have similar value.

On many agricultural practices the most reliable information available is the opinions of experts. In the absence of research, demonstration results, or reliable records, authori-

ties in the subject are often called upon to give their opinions as to what is good practice. Owing to their ability to observe in that field and to reason from scientific principles, authorities can often give reliable opinions. Many of their opinions, of course, are based upon the results of experimentation and records. Their statements then have their origin in an order higher than opinion.

Practices used by good farmers should receive consideration by the teacher. A farmer is a good farmer because he uses a number of good practices. Many of the practices used by him are based on research, demonstration, and authoritative opinion. A practice used by a good farmer but not confirmed by a higher order of information should be carefully considered before it is taught. A man may be a good farmer in spite of certain poor practices he follows. In most communities some of the practices used quite generally by the good farmers are unsound. A teacher of agriculture should usually have a better basis for a practice than merely that "it is used by good farmers of the community."

Requirements of the Vocation, or Other Uses to Be Made of the Learning. If the aim of the course is to be attained, the teaching objectives and content must be derived from the attitudes, abilities, and knowledges required for success in the vocation; or if not a vocational course, other uses to be made of the training. To inventory these attitudes, abilities, and knowledges is not an easy task. It requires much careful and rather detailed work; it is a large part of what has to be done in planning a course. Making such an inventory, however, is not only necessary in order to accomplish the aim of the course, but it is exceedingly helpful in clarifying the aim.

What are the demands of the vocation for which the training is given? In a vocational course, we must teach what is needed for vocational success. The course builder must be concerned not only with the attitudes, abilities, and knowl-

edges as they exist now in the local status of the vocation, but also as the vocation will change.

A Changing Agriculture. Vocations in agriculture are not static, they do not stand still. Several years ago Dr. Theodore H. Eaton [1] pointed out that the methods of meeting recurrent problems in agriculture change and in their evolution present new problems, and that influences from without the vocation modify practices. Practices in agriculture are constantly changing. The process is characteristic of all activities vocational. (The fact of change is not peculiar to vocations. Even "truth" changes; the world used to be flat, the sun once really set.) What is at present a typical agricultural practice may not be typical of the past, nor of the future. The distribution of agricultural activities according to the normal curve and the suggestion of evolutionary movement may be found in the accompanying figure, adapted from a diagram by Dr. Eaton. All divisions, of course, are arbitrary.

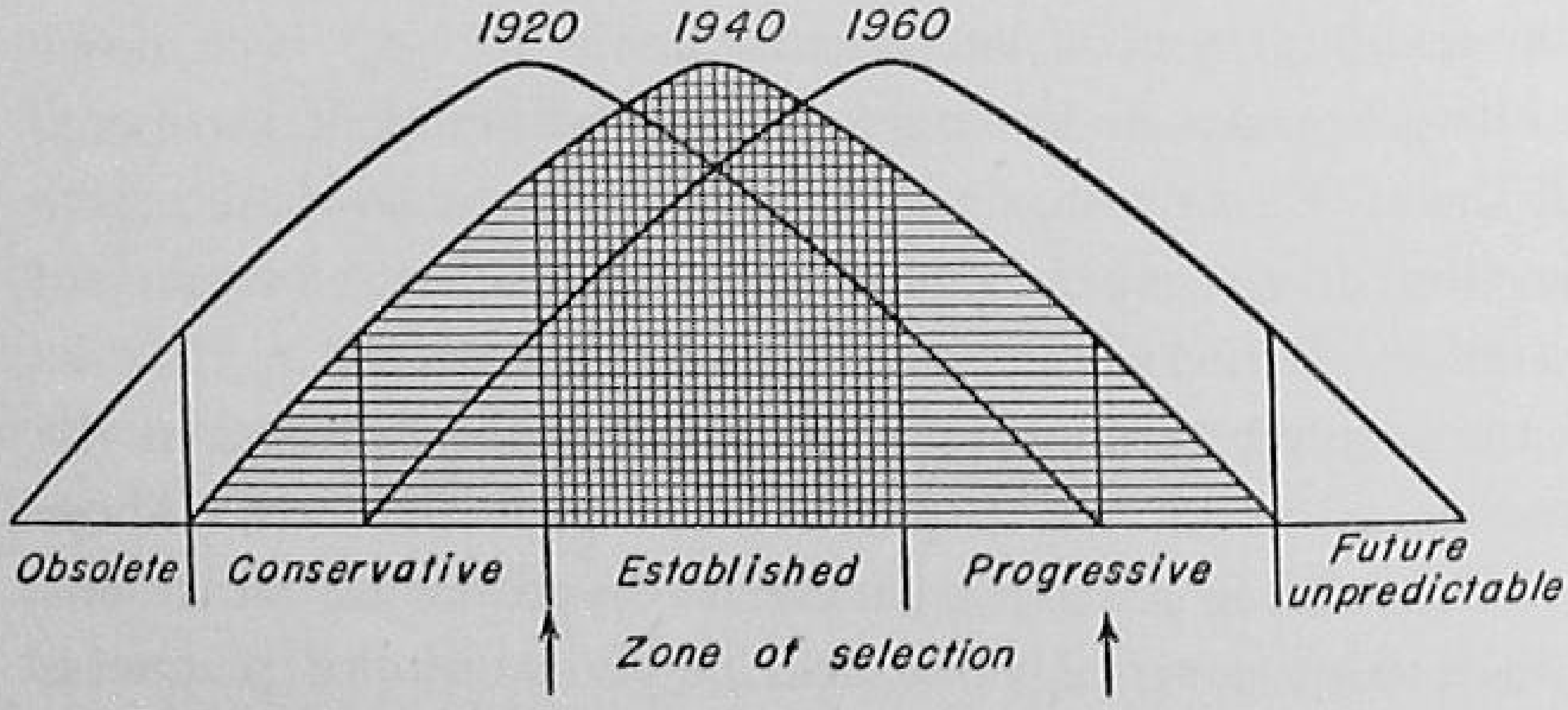

Fig. 5. The evolution of farming standards and practices.

You will note that there is a gradual shift of the norm as time goes on. To quote Dr. Eaton: "There is a reaching forward for new or better solutions of problems, a testing and

[1] Theodore H. Eaton, *Vocational Education in Farming Occupations,* J. B. Lippincott Company.

acceptance of those *fitter* till they become the *fit* of the day, and a gradual diminution in use of the less fit to the point of final rejection."

Thirty years ago spreading manure broadcast from the wagon was near the norm as a practice; spreading by manure spreader was an established practice in advance of the norm, as was driving more than two horses in a plow team. Using the self-feeder for hogs was then a radical practice, though tested well enough to indicate that it would become common. Using electric lights to keep hens busy more hours a day in the winter was an ultramodern practice, not sufficiently tested to indicate that it would become common practice. Today, dumping manure in heaps from the wagon before spreading is an antiquated practice, nearly obsolete; it was a practice on the conservative side of the norm 25 years ago. But it is still clung to by force of habit and custom among individuals and communities. The use of electric lights to keep hens busy has become common practice, while just ahead, perhaps, is the common use of bactericidal lamps to help keep down poultry diseases. So there are abilities and practices distributed all the way from the once fit, now obsolete, to those newly developed by experiment stations and other workers and tested by farmers.

In teaching agricultural practices, it is the function of the teacher to teach those practices of proved worth. These usually include practices widely used and having rather unquestionable survival value, and newly developed practices. The teacher must avoid teaching the dying, less fit. A very important function of teaching agriculture is to speed up the evolutionary process and lessen the lag between the time that practices are proved and tested and the time they become generally used. This prevents suffering and waste of human energy and may save natural resources as well as human. It makes for happiness and advancement of civilization, sparing

energy above that needed to produce the necessities of life. The teacher's job is to teach what is of proved worth, not to do experimental work. The search for new truth, experimental verification, criticism and evaluation by trained people, putting to the test of practice, is an exceedingly complex process. The college of agriculture is an agency for discovering, testing, and publishing new truth. The teacher of agriculture becomes a "disseminator" of that accepted truth; it is what he has to guide him.

The Farming Being Done. The agricultural course builder should know as much as possible about the farming that is carried on in the community, or larger region, in which the course is to be used. What crop and animal enterprises does the farming consist of? What combinations of enterprises are common? What are the frequency and scope of the enterprises? What is their relative economic importance? What are the crop yields and animal production? How are the products disposed of? What are the nature and the condition of the soil? What is the size of the farm business? What is the standard of farm living? All of these and many other questions are pertinent to have answered.

Perhaps the common-sense approach in getting informed as to the farming being carried on in a community or county (or larger area) is first to make use of the data available. If studies have been made, they should be used. If data exist except for the selecting, pulling together, summarizing, or interpreting, why not study this material before making surveys to gather original data? Then make the surveys to procure the *additional* information needed.

The United States census data by counties yield a wealth of facts on the farming being done, for those who are willing to "dig them out" and interpret the data. Tables on pages 73 to 76, made up directly from or calculated from census data, illustrate some of the possibilities.

RELATIVE IMPORTANCE OF FARM ENTERPRISES

Warren County, Kentucky, 1940—3,608 Farms

Enterprise (and yield or production)	Per cent of farms reporting	Estimated net production value *	Per cent of total net production value	Estimated cash sales	Per cent of total cash sales
Tobacco, 979 lb.	69	$ 696,334	20.5	$ 696,334	26.7
Corn, 25 bu.	82	969,265	28.6	241,205	9.2
Hay, 2.1 tons	59	455,579	13.4	299,124	11.5
Wheat, 14 bu.	14	65,012	1.9	65,012	2.5
Other small grains	..	48,312	1.4		
Other grains and seeds	..	35,643	1.1		
Pasture †	..	151,366	4.5		
Vegetables	..	162,209	4.8	8,204	0.3
Fruits	..	162,208	4.8	118,830	4.5
All other crops	..	2,422	0.1		
Forest products	..	6,062	0.2	6,062	0.2
Dairy products, 3,359 lb. milk	80	315,269	9.3	470,230	18.0
Poultry, 68 eggs	85	119,874	3.5	129,899	5.0
Hogs	62	158,890	4.7	446,460	17.1
Beef cattle	4	28,812	0.8	96,040	3.7
Sheep	10	13,746	0.4	34,364	1.3
Total	..	$3,391,003	100.0	$2,611,764	100.0
Average per farm	..	940		724	

Cash expenses per farm	$246
Number of operators working off farm 100 days and over	423
Per cent of farm products used by farm households	18.9
Crop index (based on state)	112.4

* Same as gross-production value except in the animal enterprises, where these percentages of gross value were subtracted to cover feed-and-pasture cost of the animals: dairy, 50 per cent; poultry, 45 per cent; hogs, 70 per cent; sheep, 60 per cent.

† Estimates on value of pasture include only charges for pasture consumed by dairy, hogs, beef, and sheep.

RANKING OF ENTERPRISES IN WARREN COUNTY, KENTUCKY

Enterprises ranked according to net production value	Per cent of total net production value	Net productive value
Corn	28.6	$969,265
Tobacco	20.5	696,334
Hay	13.4	455,579
Dairy	9.3	315,269
Vegetables	4.8	162,209
Fruits	4.8	162,208
Hogs	4.7	158,890
Pasture	4.5	151,366
Poultry	3.5	119,874
Wheat	1.9	65,012
Other small grains	1.4	48,312
Other grains and seeds	1.1	35,643
Beef cattle	0.8	28,812
Sheep	0.4	13,746
Forest products	0.2	6,062
All other crops	0.1	2,422

Enterprises ranked as to cash sales	Per cent of cash sales	Cash sales
Tobacco	26.7	$696,334
Dairy	18.0	470,230
Hogs	17.1	446,460
Hay	11.5	299,124
Corn	9.2	241,205
Poultry	5.0	129,899
Fruits	4.5	118,830
Beef cattle	3.7	96,040
Wheat	2.5	65,012
Sheep	1.3	34,364
Vegetables	0.3	8,204
Forest products	0.2	6,062

Enterprises ranked as to number of farms reporting	Per cent of farms reporting	Number of farms reporting
Poultry	85	3,066
Corn	82	2,958
Dairy	80	2,886
Tobacco	69	2,489
Hogs	62	2,236
Hay	59	2,128
Wheat	14	405
Sheep	10	360
Beef cattle	4	144

Farms Classified by Type, Warren County, Kentucky, 1945

Type of farm as to major source of income	Total income	Number of farms	Average income per farm
Fruit and nut farms	$ 75,348	29	$2,598
Vegetable farms	1,720	4	430
All-other-crop farms	3,245,563	1,953	1,661
Dairy farms	560,876	195	2,876
Poultry farms	51,080	32	1,596
Livestock farms	1,737,346	351	4,949
General farms	1,841,754	718	2,565
Farms producing primarily for own household use	68,309	244	279

Other Data

Average value of land and buildings per farm of 30 acres and over	$6,841
Value of implements and machinery per farm	$2,488
Value of livestock per farm	$801
Average size of farm, acres	85
Land area in farms, acres	305,977
Cropland idle or fallow, acres	13,346
Cropland harvested, acres	115,020
Cropland harvested, acres per farm	32
Proportion of tenancy, per cent	30
Hay:	
Soybeans and cowpeas, acres	139
Alfalfa, acres	12,632
Lespedeza, acres	8,590
Clover or timothy, acres	2,945
Small grains for hay, acres	501
Other tame hay excluding sorghums, acres	4,438

The agricultural census reports are by no means the only source of data already available. There may be state agricultural surveys. Frequently there are soil surveys by counties or townships. Farm-management studies are often very valuable to the course builder. Although made in particular counties or townships, they may be representative of much larger areas. In addition to showing distribution of enterprises and

Supplementary Calculations, Warren County, Kentucky

From 1940 and 1945 Agricultural Census Data

Per cent of productive man labor devoted to animals..	37
Per cent of net production value from animals........	18.7
Distribution of crop acreage, 1945, per cent of cropland harvested:	
Corn..	46.0
Tobacco.....................................	4.5
Wheat.......................................	7.5
Oats..	3.0
Barley......................................	5.0
Hay...	24.5
Cash sales per farm, minus the cash farm expenses.....	$478.00
Per cent of the cash sales from livestock.............	45.1
Per cent of the cash sales from crops.................	54.9
Productive man-work units per farm....................	193
Net production value per productive man-work unit..	$4.87
Productive man-work units per employed worker in agriculture..............................	129

Farms classified by total value of products, 1945:

Value of products	Number of farms	Total value	Value per farm
$ 250–$ 399	184	$ 57,263	$ 311
400– 599	278	136,073	489
600– 999	595	463,425	779
1,000– 1,499	608	739,934	1,217
1,500– 2,499	814	1,570,485	1,929
2,500– 3,999	470	1,466,700	3,121
4,000– 5,999	225	1,072,276	4,766
6,000– 9,999	120	913,249	7,610
10,000 and over	55	1,158,188	21,058

the emphasis placed on them, they often indicate the factors of efficiency—grouping farms as to labor income, etc.—which are bases for course building.

Rural surveys that have been made may throw light on the farming of communities or on standard of living and such things. Not to be overlooked are data from local soil-experi-

ment fields or substations, which may be representative of rather large areas.

The teacher makes a survey of a community or larger region because he desires some facts on the farming in that area which the data already available do not supply. For example, data at hand may not give recognition to local farming types. Or the teacher may wish to know the distribution of enterprises on the farms, which the available data do not show. Or he may wish to get information on the particular farms from which his students come. There are, of course, various kinds of surveys: enterprise surveys, farm-equipment surveys, farm-building surveys, surveys of agricultural occupations related to farming, and others.

If the teacher makes a survey, he must use a survey form that will enable him to obtain the facts he wants. Talking casually with a few farmers is not making a survey. One makes a survey to get facts; facts are much safer than opinions. If the teacher desires particular facts on productive enterprises, his survey form must have a place for these facts. If he wants to know the scope of the enterprises, there must be a place for acres or head or other measures of scope. If he wants to know yield or production, he must have a place to record yield or production. If facts on cash sales are desired, there must be a space for cash sales. An enterprise survey form used by a teacher is shown on pages 79 to 80.

It is useless to take a survey unless the data are interpreted. To interpret the data they must first be tabulated. The usual practice is to rule off a chart, using one line for each farm surveyed. For tabulation the farms may be numbered instead of revealing names of the farmers. Prepare a separate column for each item on the survey blank (unless some items reported are too few to tabulate). When data for all farms have been entered on the chart, each column of figures may

be totaled, and two kinds of averages figured if both are desired: an average based on total number of farms in the survey, and an average based on the number of farms reporting that item. It is well to indicate how many farms reported the item. There should be a line on the chart for that purpose, in addition to the lines for the total and the averages.

Various kinds of charts may be prepared from the completed tabulation. A chart may be prepared to show, by enterprises, the number of farmers having the enterprise, the total number of acres or head, and perhaps the average scope per farm. One of the most revealing of all charts is a distribution chart. An illustration is shown on page 81. Glancing at this illustration, one knows a great many things about the farming on these farms. For example, he knows that half of the farms are from 50 to 100 acres in size; that four out of five farms grow between 10 and 50 acres of corn; that nearly every farm grows tobacco, but only a small acreage; that two-thirds of the farms have 25 to 100 acres of pasture; that almost half of the farms grow a small acreage of strawberries; that hogs are kept largely as a home meat supply; that there are few beef cattle; that dairying is the most important animal enterprise; that almost no small grains are grown except for cover crops; that the chief sources of cash income are tobacco, dairying, and strawberries; that the farm business is small and needs to become larger; that half of the farmers keep an uneconomical number of hens; that perhaps poultry and dairying should be increased in scope as a means of enlarging the size of the farm business.

The Goals to Be Reached. If the teacher is to teach good farming, he must know what good farming is, he must think good farming. Thinking good farming is a prerequisite to good farming. The agriculture teacher must not only know the farming now being carried on in the area he serves and what practices are of proved worth, but he must know what

ENTERPRISE SURVEY FORM

Name of farmer.. Date...............

Location of farm...

Acres in farm.................... Total acres in pasture.........................

	Number of acres last year	Total yield	What part of the crop did you sell? (½, ¼, ¾, etc.)
Corn for silage			
Corn for grain			
Oats			
Wheat			
Rye for grain			
Rye as cover crop		XXXXXX	
Barley for grain			
Hay, all			
Hay, alfalfa			
Hay, clover alone		XXXXXX	
Hay, clover and grasses mixed		XXXXXX	
Grass hay		XXXXXX	
Soybeans (hay or grain)		XXXXXX	
Cowpeas		XXXXXX	
Lespedeza		XXXXXX	
Sweet clover		XXXXXX	
Tobacco, Burley			
Tobacco, dark			
Cotton			

Enterprise Survey Form (*Continued*)

Tons of lime used last year............ Pounds of phosphate used...........

Amount of other commercial fertilizer used last year........................

On what crops was most of the commercial fertilizer used?...................

Animal	Number on hand	Animal	Number on hand
Dairy cows, 2 years old and over		Ewes over 6 months old	
Beef cattle, 1 year old and over		Chickens over 4 months old	
Sows and gilts farrowing in spring or fall		Turkeys over 4 months old	
Other hogs and pigs over 4 months old		Horses and mules over 27 months old	

Products Sold Last Calendar Year

Milk	$	Vegetables	$
Cream or butterfat	$	Broilers and fryers	$
Butter	$	Eggs	$
Fruit	$	Hogs	$

Calculations for the Farms from Which Agriculture Students Come

Yield per acre of corn..........., wheat..........., tobacco..........., cotton..........., hay............ Crop index............ Per cent of cropland in legumes............ Total productive man-work units............

constitutes good farming there in its larger aspects. His teaching should contribute toward raising farm people to the highest social and economic level possible.

Good farming includes the making of a good income from farming and the enjoyment of farm life. It should leave the farm better and more productive than it was. Some of the most important elements in making a good farm income are

Distribution of Enterprises on Farms Surveyed

Number of farms surveyed—50

	Distribution of acres or number of livestock									
	1–4	5–9	10–14	15–24	25–49	50–99	100–149	150–199	200–299	Over 299
Acres in farm					3	24	11	3	6	3
Corn		3	16	12	12	6				
Tobacco	44	3								
Wheat		1	2	2	1					
Oats										
Rye, cover crop	4	5	5	7	7					
Hay (all)	2	8	19	11	5	4				
Dairy cows	18	18	9	3	2					
Beef cattle	4	1	3	1						
Sows	18	2	1							
Other hogs	17	5	2	2	3	1				
Ewes										
Hens			1	3	19	12	6	3		
Pasture			7	9	19	14	1			
Strawberries	22									

listed below. The course builder and teacher must give due consideration to these elements:

1. Good size of farm business. One should not expect a good income from a very small business.
2. Wise choice of enterprises. The choice of the enterprises is very important to the success of a farm business.
3. Good yield of crops and good production of livestock. Good farmers usually get larger crop yields per acre and greater animal production than do average farmers.
4. Good balance among enterprises, especially between feed crops and livestock where animals are important in farming. Good balance is necessary to make the best use of land and labor and to control expenses.

5. Efficient use of all the farm land. Farmers with good incomes have as much of the land in use as much of the year as possible. Good land use requires that the land be productive.
6. Effective use of labor on the farm. Good farming uses labor efficiently. Efficient labor produces a great deal per man.
7. Proper control of farm expenses. Farm income is the difference between the value of farm products and the operating expenses of the farm.
8. Adequate supply of home-produced food. Food produced and conserved at home aids greatly in cutting down family expense, making more money available for other uses. Also, people on the farm have the right to eat well and to be properly nourished.

Farm people can make a good living from the land; they can have a good standard of life. If they cannot, farming is not a desirable vocation to train for. A good standard of living is a part of good farming.

Production goals are discussed on pages 185 to 187, in the chapter on Supervised Practice. These goals have a bearing on the course of study.

Building a High-school Vocational Course of Study

Considering the four major factors already discussed and gathering the necessary information will not give the agriculture teacher a course of study. The course is yet to be worked out. In working out the course, many decisions must be made. Some of these decisions involve philosophies and points of view on which there are differences of opinion among workers in agricultural education. Do not be disturbed unduly if this book states some points of view different from the ones you

hold. Maybe yours are better. Perhaps, in some instances, you should modify your views.

Considering the Farming Programs for Boys. One cannot intelligently plan a course for boys in vocational agriculture—giving due consideration to their needs, the purpose of the course, and the necessity for practice—without considering the farming programs the boys have or are likely to have. These programs probably have several common elements, which will be suggestive to the teacher in planning the use of his classroom teaching time. Most of the course content should be selected and arranged so as to make the greatest possible use of supervised farming as a means of teaching. A great deal of the teaching at school should contribute to the success of the farming programs of the boys.

Not only will the farming programs of the boys be suggestive of the enterprises and other similar large divisions to include in the course, but much classroom teaching time should be allotted to supervised farming as such—selecting and planning the farming programs, record keeping, summarizing projects and total farming programs and interpreting the results, problems being met by the boys which are not included in the other large divisions of the course for that year, and the like.

Deciding on the Teaching Objectives. Chapter 3 is on The Teaching Objectives. The teacher must have teaching objectives if he is to teach. If the teacher states his teaching objectives, his course of study may very well be set up on the basis of these objectives. The manner of stating objectives is discussed in Chap. 3.

The teacher must decide on his teaching objectives before choosing the course content he expects to use, since content is "the design for attaining the objectives."

The teacher should choose those objectives which are most significant to attain. He cannot attain all the possible worth-

while objectives; he cannot teach everything in agriculture; he does not need to cover any enterprise or subject completely. In Chap. 2 on The Learning Process, it is strongly implied that most teachers would be better off if they attempted to teach fewer things and taught them better. Each farm business has a few enterprises that call for special proficiency on the part of him who would succeed in that business. Also, at least a fair degree of overlearning should usually be secured if much retention is to be expected.

In deciding on his teaching objectives, the teacher of vocational agriculture will come to grips with what he should do with the contributory sciences. In order to attain certain teaching objectives, perhaps some botany will need to be taught, some chemistry, some bacteriology, some entomology, some physics, some mathematics, etc. Manifestly, whether the contributory science should be taught depends on just what the teaching objectives are—specifically what abilities and what degrees of ability are to be developed, what understandings, what attitudes.

The teacher should clearly differentiate between objectives for all members of the class and objectives for certain individuals only. The former objectives constitute the areas for group teaching; the latter, areas for individual problems. Both of these types of teaching in vocational agriculture are important. The group-teaching objectives should be decided on in working out the course of study, and ample time should be allotted for the boys to work on their individual problems in agriculture.

Deciding on the group-teaching objectives is no simple matter. These decisions directly affect the course of study. The teaching objectives largely determine what shall be taught and when and how it should be taught. The scope or inclusiveness of the objectives influences the arrangement of the

course by years. Each large objective suggests a grouping of subject matter. The grouping of subject matter necessary to attain the objectives may call for consecutiveness in teaching, perhaps securing the necessary generalization or other learning before going on to something else. Whether it does or not, the teacher must decide in what manner he will attain each large teaching objective—by consecutive teaching, by attaining certain aspects of it at one time of the year and other aspects at another time, by attaining certain aspects of it one year and other aspects in a later year or years, by attaining certain aspects through group teaching and other aspects through individual instruction, and so on. A high degree of intelligence is required to decide on the group-teaching objectives.

Part-time Farming. The teaching objectives for training in part-time farming will be different from the objectives for training in full-time or commercial farming. The farming problems are different; the course of study should be different.

In part-time farming, the family usually lives on a small farm (or at least a farm with little cropland) but draws a good portion of its income from some other source. There are many part-time farmers around every large town, and in most mining regions and other rural regions where large numbers of people follow nonfarming occupations. There are part-time farmers in or near almost every small town or village.

Some facts or suggestions for the course builder follow:

1. In part-time farming, producing and conserving the home food supply is usually the most important production. The first crops to be considered in deciding on the crops to grow are usually vegetables and small fruits for family use. Many part-time farmers produce their own eggs and milk and perhaps most of their meat. Chickens lend themselves well to part-time farming.

2. The machinery and power needed are quite different from that needed for full-time farming. The difficulty of providing these at low cost is one of the disadvantages of small farms. Horses are usually out of the question unless the farm contains 12 to 15 acres of good cropland.

3. Part-time farmers generally find it more profitable to buy much of their grain feed than to produce it.

4. Since part-time farming (other than being a way of life) is chiefly a means of using labor that would not otherwise produce returns and because the amount of man labor per acre is usually large, it is very desirable that the land be productive. The land should be naturally productive or made productive; it should be kept productive.

5. The part-time farmer's need for abilities in home beautification and improvement is perhaps as great as that of the full-time farmer. Such abilities, many of which are mechanical in nature, will enable the part-time farmer to use his spare time to advantage and may contribute to success in his nonfarming occupation.

6. Farm management for the part-time farmer is different from that of the full-time farmer. But the part-time farmer has farm-management problems, particularly in making the best use of the relatively large amount of man labor required. This calls for work simplification. There is such a thing as economical units of enterprises for part-time farming. A common mistake made by part-time farmers is in trying to have a little of everything.

Arranging the Course by Years. Most states offer four years of vocational agriculture. The course of study is arranged by years. Whether the boys in each year of high school can be taught as a separate class depends largely on the number of boys and the number of teachers in the department who teach high-school groups. Few departments are large enough to have separate classes for boys of different vocational interests.

It is desirable, though not always possible, to have first-year boys in a class by themselves (see page 90).

Types of Course Arrangement. Perhaps few schools today have the type of course arrangement so commonly found in the early 1920's, such as: first year, farm crops (nothing else); second year, animal production (nothing else); third year, farm mechanics or soils; fourth year, farm management and economics. This was the extreme similar-enterprise type of arrangement.

The two most common types of course arrangement by years now found are the cross-section type and a modified cross-section type. In the cross-section type of arrangement *both* animal enterprises and crop enterprises are included in the course each year, for most or all the years. In the modified cross-section type of arrangement, livestock *or* field crops usually receive special emphasis during the year along with any other things that may be needed that year. This is particularly true in the early high-school years. No contention is made here that one of these types of arrangement is good and the other bad. Properly worked out, either of these two types of arrangement can be effectively related to the supervised farming programs; either can meet the needs of the boys and of the community; neither type of arrangement is adapted to the use of textbooks.

It is rather generally agreed that in a crop-growing community not all the teaching of crops should be done in one year, with no crop problems handled in a later year. And where farm animals are important in farming, there should be some farm-animal problems each year. Likewise, each year there will be problems in farm management and the business of farming which should be included in one division or another; farming programs cannot be carried on without getting into the business side of farming. Many people feel that some farm shop should be taught each year.

On page 89 is a four-year layout, by years, of a high-school course in agriculture in Madera Union High School, California, illustrating a cross-section arrangement. Notice how several of the enterprises, started in agriculture I, are carried through all four years.

On page 90 is a four-year layout of the course in agriculture in a school in Warren County, Kentucky, illustrating a modified cross-section type of arrangement. The county and community in which this school is located are the ones for which census data and some farm-survey data have been presented in this chapter.

In neither of these two illustrations of four-year layouts are all the crop problems handled in one year, all the animal problems in another, farm management limited to still another, and so on. In the Warren County, Kentucky, illustration the teacher each year deals with crop problems, animal problems, and farm-management problems, in his supervised farming and individual problems. The breakdown of the supervised farming problems is not shown in this layout.

There have been many developments since the early 1920's that have a bearing on arranging the course by years. Formerly, teachers thought they had all the time they needed for teaching agriculture; they actually had more time than they knew how to use. Today teachers face the difficulty of finding enough time to teach what they would like to teach. Most states now have good school farm shops and devote considerable time to teaching shopwork. The Future Farmers of America has come into the picture with its demand for some teaching time. It is now fairly common practice to set aside individual-problem days. Much more teaching time is devoted to supervised farming than formerly. New categories have been developed to be included in the course, such as land use, farm forestry, home food supply, farm-home beautification and improvement, farm improvement, fire preven-

FOUR-YEAR LAYOUT IN VOCATIONAL AGRICULTURE

Madera Union High School, California

Agriculture I

	Days
Introduction, F.F.A., etc.	25
Farm accounts	28
Livestock:	
Beef	5
Dairy	8
Swine	6
Horses	6
Sheep	6
F.F.A. meetings	13
Pictures	25
Field trips	12
Activities	15
Magazines	14
Optional (cleanup, etc.)	3

Agriculture II

	Days
Introduction	3
Farm accounts	34
Livestock:	
Beef	10
Dairy	11
Swine	10
Horses	5
Sheep	0
Trees, fruit	15
Grafting and budding	15
Grapes	15
Field trips	4
Activities	14
Pictures	28
Optional (pruning and cleanup)	7

Agriculture III

Introduction and seating	1
Farm accounts and account books	30
Livestock:	
Judging beef cattle	7
Judging dairy cattle	10
Judging swine	5
Judging horses	3
Judging sheep	3
Permanent pasture	10
Grape production	21
Potato production	9
Tomato production	4
Truck crops	16
Activities and judging review for state finals	16
Pictures	35

Agriculture IV

Introduction and seating	2
Farm accounts and account books	30
Genetics	10
Scientific feeding of animals	8
Farm leveling	8
Farm organization and management	14
Farm credit	6
Cooperative organizations	8
Soil and water conservation	6
Agricultural economics	12
Farm marketing	17
National farm organizations and Federal agencies in agriculture	8
Judging review	5
Pictures and activities	36

tion, farm safety, farm finance, farm organization, and agricultural exploration and guidance. These developments tend to lessen the time that can be given to the enterprises as such and make extremely unwise the use of teaching time in any unnecessary repetition. There is such a thing, of course, as desirable repetition in teaching, but there is no place for mere

FOUR-YEAR LAYOUT IN VOCATIONAL AGRICULTURE

Bristow High School, Warren County, Kentucky

Agriculture I	Days
Field crops:	
Soil in relation to crops	15
Corn	13
Tobacco	27
Alfalfa, hay	9
Pastures, elementary	9
Supervised farming	36
Individual problems	18
Farm shop	30
F.F.A.	10

Agriculture II	Days
Livestock:	
General (feeding and such things that cut across all farm animals)	29
Dairy	29
Poultry	9
Supervised farming	30
Individual problems	28
Farm shop	32
F.F.A.	10

Agriculture III	
Soils and land use	49
Pastures, advanced	15
Supervised farming	30
Individual problems	30
Farm shop	33
F.F.A.	10

Agriculture IV	
Home beautification and improvement	26
Farm shop (related to home beautification and improvement)	36
Farm management	30
Supervised farming	30
Individual problems	35
F.F.A.	10

repetition. Conserving time is now a big problem. Where time can be saved through the arrangement of courses, it should be saved.

First-year Agriculture. It may be questioned whether first-year agriculture in high school should be vocational. Exploration and vocational choice should precede vocational preparation. Normally boys begin their ninth year of school at the age of 14, when they are very immature for occupational training.

The first year of the four upper high-school years is an appropriate time to give attention to orientation in farming and related occupations, occupational exploration and counseling, an appreciation of farming as a vocation and as an avocation or part-time occupation, and an understanding of the nature of vocational training in agriculture. It is also an ap-

propriate time to lay a foundation for those boys who are to continue into vocational agriculture. This foundation may include certain aspects of elementary science that contribute to agriculture. The exploration or "work experience" should include supervised farming. Boys cannot very well learn what vocational agriculture is, nor will many of them know their aptitude for farming, unless they "try their hand" at supervised farming. All the boys who continue into vocational agriculture should have a good start on their farming programs when they begin the vocational work.

If first-year agriculture is given to serve a prevocational purpose, it can act as a selective agency of those who should take the vocational work. Vocational training presupposes selection of those who need and can profit by the training. Selection is needed in order to give the best vocational training possible to those who take it. Farming vocations are becoming increasingly selective as to the qualifications of those who succeed in them as owners or managers.

If the teacher or the school is not in a position to make first-year agriculture truly prevocational, perhaps the next best thing to do, if possible, is to have first-year boys in a class by themselves where they may be properly oriented and introduced to vocational agriculture.

Prevocational agriculture is discussed in Chap. 12.

The Factors of Difficulty and of Maturation. Difficulty and maturation should receive consideration in arranging the course by years, though they are often overlooked. High-school juniors and seniors can deal with more difficult material than can freshmen and sophomores. They can grasp more difficult concepts; they can work longer and on larger and more complex problems without getting "lost" or becoming discouraged.

There is a close relation between development of ability to learn and maturation. Ability to learn increases as boys mature.

Interests become different with structural growth or maturity —agricultural interests and other life interests. The course builder should recognize these facts. The average high-school freshman is just beginning to achieve maturity; the senior is much further along. What interests one may be of little concern to the other. Many aspects of farming that are not of interest to boys are of interest to young men or adult farmers. Boys do not have the opportunity to deal with certain aspects of farming.

Arranging the Course within the Year. If a great deal of teaching time is allotted to supervised farming and if much of the other content makes the greatest possible use of supervised farming as a means of teaching, there must be good arrangement of the course within each year. For example, good arrangement will set aside teaching time for planning farming programs when the planning of the programs should be done. It will allot time for setting farming-program goals when these goals should be set. It will provide time for teaching record keeping when such teaching will function. It will allow time for summarizing and interpreting records when there are records to summarize and interpret. If the classroom teaching is to contribute to the doing of a production job in the boys' farming programs, it should not be too far removed from the doing time—so that interest may be present, and in order to promote additional learning through the doing and to shorten the period of forgetting before carrying out the practice.

Seasonal Sequence. Seasonal opportunity is a factor in determining when certain classroom teaching should be done. It is also a factor in determining what is to be taught at all. The months of the year that school is in session make possible or impossible the teaching of some things in every community, as any capable teacher knows.

Good use of "seasonal sequence" in arranging the course

requires teaching intelligence as well as a calendar of farm practices—the calendar of practices is not enough. The teacher cannot on May 1 teach everything farmers are doing that day. Teaching is not done that way. Nor will good organization of subject matter permit teaching one thing today, an unrelated thing tomorrow, something still different the next day, and so on day after day. Although agriculture should be brought to bear on the problems of life, knowledge also needs to be related to knowledge—there should be good organization of subject matter. Good organization for teaching purposes calls for reasonable amounts of consecutive teaching time. Vocational agriculture does not have to be chopped into tid-bits in order to make use of seasonal sequence. It is neither necessary nor desirable to deal with everything in the course of study each month. The wise teacher will do some intelligent grouping of what needs to be taken up in the course in a given year. He can have rather large blocks of subject matter much of the time, using several days together or even a few weeks in attaining one or more rather large teaching objectives.

Preparing Time Allotments. The amount of content to be included in the course is determined finally when the teacher makes his time allotments. A teacher must allot time to teach the things he proposes to teach. Otherwise something is wrong with his planning. It seems wise for the teacher first to decide on the number of days or teaching periods he expects to use in attaining *each of his fairly large teaching objectives*. He can make amount-of-time estimates one year or course at a time, total the estimated amounts of time needed, and check this total against the amount of time available. Then he can adjust his objectives, content, and time until the total time he plans to use is in line with the amount of time he can use. Making these adjustments will necessitate some trial and error

—cutting and fitting. After the amounts of time that will be used are decided on, but not before, the teacher can plan the distribution of time month by month and decide on the sequence within each month. A monthly time-distribution sheet should be prepared for each year, showing the amounts of time and the "when" for each enterprise or other division of the course. Some teachers carry the breakdown a step further, showing what will be done each week.

Summary of Steps in Building a High-school Vocational Course. The first step in building a course of study in vocational agriculture is to have a clear concept of the aim of the course and its relation to the vocational needs of the boys and to their educative environment. Additional or contributory steps are about as follows:

1. Gather and interpret facts on the farming being done in the community. This will usually involve making an enterprise survey and interpreting census data. Use should be made of any facts and interpretations that are already available.
2. Secure facts on the farming programs the agriculture boys have or are likely to have.
3. Decide on the group-teaching objectives to be attained through the course. (The objectives must be stated.)
4. Arrange the course by years, indicating all the main divisions in the course and the approximate number of teaching days to be used for each division, in the light of the teaching time necessary to attain the group-teaching objectives and the time for individual problems. At first, the allotment of teaching time is tentative. Final allotment should be made before taking step 5.
5. Arrange the course within each year, and prepare such teaching calendars as will be helpful.
6. Select the content to be used in attaining the teaching objectives. (This may include even the teaching plans.)

Building Other Courses of Study

Constructing a course of study for teaching general agriculture in the high school is discussed briefly in Chap. 13 on teaching general agriculture.

In Chap. 12 on Teaching Elementary and Prevocational Agriculture are some suggestions on the course of study.

Chapter 10 on Teaching Young-farmer Courses and Chap. 11 on Teaching Adult-farmer Courses contain some suggestions on course building for these groups.

CHAPTER 5

USING PROBLEM SOLVING IN TEACHING

Most good teachers of agriculture do their teaching partly or wholly on a problem basis. They guide or direct their students in solving problems rather than attempt to teach facts from textbooks. Obviously, in solving problems the students engage in an active process, which is always necessary to learning. The process engaged in is a *thinking* process. Thinking on the part of the students is usually present in good teaching.

In this book, problem solving refers to the task of making decisions or doing things the learner wants to make or do, the nature of which he is able to understand, but for which at the time he has no solution. It is neither solving puzzles at one extreme nor dealing with the already-known and understood situation at the other. In a problem situation the learner is perplexed but he is not utterly confused. He faces a difficulty but he is willing to try to remove it. A problem implies a difficulty to be overcome; where there is no difficulty there can be no problem. Most of the problems that should be used in teaching involve meaningful relations, and are to be solved by discovering and using those relations.

Much that is called problem solving in teaching is not problem solving. A "problem" listed in a publication a few years ago was, "The apple, a type of pomaceous fruit." A teacher of agriculture once used this problem: "What do you think of sanitation in relation to hogs?" Another teacher

said, "Our problem for tomorrow is oats." There is no virtue in simply saying that one is using a problem-solving procedure, no magic in the word problem. The virtue in problem teaching lies in the quality of the problems and the manner in which they are used. Use of problems, even of good problems, does not ensure good teaching.

Bird's-eye View of Typical Procedure in Problem Solving

The central and essential characteristics of problem solving in teaching is the solving of problems. The use of any situation in teaching so as to require the mental activity of problem solving may be regarded as "problem teaching." Obviously, if one is to solve a problem, he must first have a problem. So must a class or a group. Problems used in group teaching should be problems that are at least fairly common to the members of the group; that is, most of the members should recognize the problem as such and be challenged by it. There can, of course, be a group problem which the group faces as a group, not as individuals.

There are many kinds of problems and much variation in the procedures for solving them. The variation depends chiefly on the character or type of problem and the nature of the class. Good procedure for a class of high-school boys would not ordinarily be good procedure for a group of adult farmers. The common general procedure, however, in problem solving by a group consists of about the following steps or phases:

1. Discover the difficulty *in a situation*. Difficulties do not exist apart from situations.
2. State the problem which when solved will remove the difficulty.
3. Analyze the problem, with the group, so that they may see how to solve it. This need not be done, of course,

if each member of the group can make his own analysis.

4. Each student finds the information needed that he does not possess and solves the problem. In a group where the individuals already have the information, they do not need to find it.
5. Through a discussion, under teacher guidance, pool the findings and decisions and arrive at a final conclusion.
6. Do whatever remains to be done to remove the difficulty. The conclusion or certain aspects of it may have to be carried out overtly before the difficulty is removed.

Suppose, for example, that many boys in a class in vocational agriculture have hay-consuming livestock in their farming programs and want to know what hay crop would be best for them to grow, and that the soils in the community require liming and phosphating if one is to succeed with alfalfa. This is the *situation*, at least in part. Now suppose that the problem were stated and analyzed with the class to look like this:

PROBLEM: What hay crop should we grow?
  Feeding value of the hays that are considered
  Yield expected
  Soil treatment necessary for success
  Soil-building value
  When the labor is needed to save the hay

In this illustration the items listed under the statement of the problem are to be considered in solving it; they constitute the analysis. After the problem is analyzed with the class, the manner of solving it made clear, and perhaps the references suggested, each boy goes to work and solves the problem for himself (phase 4 above). When this has been done, a group

discussion follows—under the direction of the teacher—and a final group conclusion is arrived at (phase 5).

Notice that, in this illustration, the procedure calls for a decision to be made on, "What hay crop should we grow?" The answer is not found in a book, though references are used in supplying the needed information. The reading is done to help solve the problem. Relationships are seen and used by the students. There is no recitation, in the ordinary sense of the term. These things are characteristic of problem solving in teaching.

Further Clarification. A bird's-eye view of problem solving has been presented under this heading, not a complete discussion of it. May we repeat: There are many kinds of problems and much variation in the method of using them as teaching devices. To accomplish the teaching objectives by using problems in teaching, good problems must be arranged in the proper order. A random collection of problematic situations will not enable the teacher to succeed with problem solving in teaching. The use of unrelated and disconnected problems can lead only to confusion and lack of understanding of what should be learned. This condition can, and must, be prevented. A much more detailed discussion of problem solving follows.

Relation of Problem Solving to Thinking

Thinking and problem solving are intimately related. The typical steps, aspects, or phases in problem solving are very similar to those in reflective thinking. A teacher must be interested in understanding the process of reflective thinking and the part it plays in learning and teaching. Reflective thinking is a chain of thought that aims at a conclusion, a solution. It makes action with a conscious aim possible. It makes pos-

sible systematic plans and preparations for the future—to secure particular results, avoid undesirable outcomes, and the like. It also enriches things with meanings and gives increased understanding.

The Process of Thinking. Reflective or purposeful thinking takes place only when something occasions or evokes it. Prerequisite to thinking (or solving a problem) is a goal to be reached. In attempting to attain the goal—in getting to where one wants to go—a difficulty or difficulties are met, or there is no occasion for reflective thinking.

For thinking to take place (or for there to be a problem) one must encounter a *difficulty* which stands in the way of attaining his goal. The problem, if one is to attain the goal, is to find a way out of the difficulty. The difficulty sets the problem to be solved; out of it grows the question to be answered. A difficulty does not guarantee thinking, but it is a prerequisite to thinking. For reflection to take place, one must encounter a difficulty and must stop and consider how he will overcome it rather than act without thinking on the one hand or give up on the other; he must be willing to endure suspense and to undergo the trouble of searching.

Given a difficulty to be overcome, the accent shifts from the goal itself to how the difficulty will be overcome. There is usually a certain opposition between action and reflection. To go immediately into action reduces the thinking in the behavior pattern. Generally speaking, it is necessary to repress action; one must wait, he must "think it through" before he goes ahead.

The phases or aspects or steps in thinking—including those prerequisite to thinking—as listed below, are adapted from John Dewey's analysis of a complete act of thought. (Notice how similar the phases are to the steps or phases in problem solving in teaching, pages 97 to 98.)

1. A difficulty is encountered in reaching one's goal.
2. The "felt" difficulty or perplexity is intellectualized into a problem to be solved, a question for which the answer must be sought.
3. There are suggestions of a possible solution—alternatives, hypotheses—which are used to guide the recall or the collection of factual material needed to solve the problem. One cannot think without facts.
4. The suggested solutions are weighed by a reasoning process, using facts already possessed or that have been collected, until a solution is tentatively accepted as the way out of the difficulty.
5. A final conclusion is arrived at by verification of the *tentative solution.* The consequences need to be carefully traced out before accepting the solution as final. Often the idea must be verified or tested by overt action.

A Difficulty and Its Location. Every act of reflective thinking begins with a felt difficulty. If one can already react appropriately (as he sees it) to the situation, there is no difficulty. A difficulty, to occasion thinking, must be more than a feeling that something is wrong. It must be located; one must know more precisely what the difficulty is before he can have suggestions for solutions. That disease is attacking one's plants may seem terrible. But just to be aware of the terribleness of the disease is not to have a problem. However, if one centers his attention on how to control the disease, he is then tackling a problem.

Suggestions for Possible Solution. When the problem has been located, suggestions for possible solution are in order. Past experience—particularly experience with similar situations—is helpful here. The suggestions further clarify the problem and serve as a basis for further thinking by indicating the procedure to be followed in solving it.

Weighing Suggested Solutions. Alternative suggestions compete with one another. A person is faced with determining which suggestion is likely to give the best solution. One may already possess the facts to be used in weighing the suggested solutions, or he may have to secure them—from whatever source he can. The facts must be assembled according to the conditions of the problem.

Conclusion and Verification or Testing. Is the conclusion sound? Is it in keeping with the facts? Will it work? If the consequences, when traced out, fail to conform to the conclusion, something is wrong.

In the complete act of thought, one begins with a difficulty —a troubled situation—and comes out with the difficulty removed—a solution.

Reasons for Using Problems in Teaching

Reflective thinking and problem solving are much the same thing. Thinking comes very close to being the method of an educative process. As John Dewey contends in *How We Think*, the essentials of method are the essentials of reflection. Problematic situations for the learners must exist if the learners are to think reflectively; they should be used in teaching if we expect the learners to do reflective thinking while being taught.

Learners should do reflective thinking while being taught, for several reasons. Enrichment of meaning, development of understanding, acquiring information in useful form, preparation for meeting new situations intelligently, all call for thinking. Also, training to think well *in any given field or subject* (agriculture, for example) is one of the desired results of instruction in it. If a person is to be taught to think in a field, he must think while he is being taught. One learns to think in a field or subject by thinking in it. Success in a field usually depends on the ability of the person to think effec-

tively in that field. Investigation has made it apparent that the acquisition of an ability in one field does not necessarily mean that the ability can be used in other fields. One should be trained to think in the field or fields in which he will later need to think. He should expect "carry-over" to other fields only to the degree that there is overlapping, similarity of elements.

In his *Education and Vocations* Dr. Theodore H. Eaton points out that the "problem method" often plays an important part in good vocational preparation and also explains why it does. The problem is representative of the activities of many vocations. Many vocations consist to a great extent of problem solving. Farming does. To the extent that it deals with unstable and changing situations, every vocation has its elements of newness that cannot be effectively handled by fixed habit only. Hence there is a difficulty, alternative, or "fork in the road"—the essential element of a problem. Experience in solving problems is the primary if not the sole means of developing such adaptiveness.

The chief reasons for using problem solving in teaching are listed below. (There is some overlapping in the list, and some duplication of what has already been said.)

1. The problem acts as a selective agency in gathering pertinent facts and organizing them into a connected viewpoint. It tends to favor the perception of facts appropriate to the solution of the problem.

2. In problem solving, significant facts are taught in useful association and thus will be more likely to be used when the need arises. These facts take on a meaning they would not otherwise have; they become items of experience rather than external realities. One's knowledge of a fact is its residual effect on him, of what he has done with that fact, the use he has made of it. In problem solving, the teacher and the learn-

ers get an idea of relative values—the usefulness of the fact or thing being considered.

3. Problem solving places emphasis on use of material rather than on memorization of it.

4. The solving of a problem by the learner calls for the use of old things in new ways. Thus there is desirable practice of what is to be learned or retained, the act of invention is fostered.

5. Problem solving in teaching contributes to the development in the learners of a habit of evaluation and using data intelligently in a new situation.

6. Since problem solving calls for pause and weighing of possibilities and alternatives, it contributes to the development of open-mindedness. The only way to teach a student to pause, weigh, examine, and criticize is to have him do these things in the process of his learning. That he must do in solving problems.

7. Proper use of problem solving should contribute to teaching the learners to discover problems. Problems do not arise; they are discovered.

8. When problems are used in teaching, the learner always has an idea of what he is to do in solving the problem. He knows the problem to be solved, and perhaps the alternatives that need to be considered, what is to be learned, where to find the needed information. Most students learn very laboriously or not at all unless they know such things. These statements do not mean that in problem solving the learners follow directions. Far from it. One does not solve a problem by following directions.

9. Problem solving lends itself to learner participation in all its phases or aspects. (Phases are listed, pages 97 to 98.) The teacher has the opportunity to direct the learner's activity—which is the whole of teaching.

10. The many variations in kinds of problems and methods of solving them give rich opportunity for flexibility in teaching procedure.

Formulating the Problems to Use in Teaching

This discussion has to do with formulating the problems to use in *group* teaching. There is no end to the number of problems that may be used in teaching individuals, on the farm and at school. The individual problems may be decided on and formulated as the occasion demands. Teachers often have trouble in finding problems to use in their group teaching. Most books are not very suggestive. The teacher may have to face this responsibility more or less alone.

The teacher must decide on his teaching objectives before he can select problems to be used in attaining them. Unless the problems help attain the teaching objectives, there is no reason for using them. The problems must get their sanction from the objectives to be achieved. This is true regardless of the nature of the teaching objectives—whether they are to teach principles and important facts of general application, to develop abilities, or to produce attitudes.

There is no one best problem or set of problems to use in attaining a desired objective. The peculiar situations that give rise to the problems, the resources at hand, and the needs of the particular learners determine the character of the problems that should be used in teaching. Problems that are ideal for one class or school may not be suitable for another. There is no one best way to state a problem. However, good problems or series of problems and their statements have certain characteristics. These we shall discuss presently. Teachers who wish to use problem solving in teaching must exercise great care and must have some measure of skill in the selection of their problems. The teaching procedure will be no better than the problems used.

Discovering the Difficulties in Situations. Difficulties give rise to the problems to be solved; out of the difficulties grow the questions to be answered. A difficulty consists essentially of an obstacle met in reaching one's goal, met in going to where one wants to go. One does not have a problem unless he has a goal and meets a difficulty or obstacle in his way. The difficulty, of course, has to be isolated before it can be removed; and one must try to remove it if he is to solve the problem.

Difficulties do not exist apart from situations. There may be one or several difficulties in a situation. A difficulty is felt always; one is concerned about his difficulties. Weaknesses in farming practices or in abilities or information do not in themselves constitute difficulties. A weakness in a farming practice is not a difficulty to a boy or farmer when someone else has discovered it, but only when it is revealed to him, only when he is concerned with it. The boy or the farmer (in this case) is the one who has the difficulty, not the teacher.

A difficulty that a person wants to overcome may be anything of which he is aware that stands in the way of attaining his goal. It may be one of what to do, or how to do it, or whether to do it, or when to do it; it may be any other kind of choice or decision that must be made; it may be a learning that needs to be acquired to achieve one's goal (a particular ability or understanding or other learning); it may be the removal of a more concrete obstacle such as the securing of some object or material means; it may be of almost any nature. Although a difficulty has a quality of not being easy, it is not just something that is hard to understand or perform. Obviously if one is to remove a difficulty he must be able to remove it. Also, if its removal is to constitute a problem for him, he must be conscious of the difficulty, must want to remove it. A difficulty for a person is not so much a matter of the thing to be done as the relation of himself to that thing. For group problem solving, the difficulties to be overcome

must be difficulties that are adjusted to the group, being neither too difficult nor too easy.

If the teacher is to have good problems to use in teaching, he must be familiar with the situations that may give rise to problems. He also must be adept at recognizing the difficulties that may be met by the learners and thereby constitute their problems. Some of these difficulties the learners will meet themselves, other difficulties they will have to be caused to meet—caused to discover and become concerned with. An important purpose of teaching is to provide *needs* for learning. One of the main tasks of the teacher is to contrive situations. The learner must be made conscious of a situation before it is a situation for him in a psychological sense. Always, too, the mind responds to meanings, not just to physical stimuli.

Finding Problems. A difficulty is an obstacle met in attaining one's goal or objective. Difficulties do not exist apart from situations. These facts are cues for the teacher in finding problems. Situations in which people are grappling with the realities of life are a rich source of good problems. Often the teacher will need to modify the situations and problems so as to make them function in the best possible manner in attaining his teaching objectives. He should find and use the problems that will enable him to attain his objectives. Care must be taken to see that learners become concerned with what lies beyond the reaching of their immediate goals, lest understanding be neglected and too few principles taught. The good teacher does not overlook the needs of learners. People facing the realities of life often do not keenly desire understanding. Here the teacher must fall back on his own resources. It is very necessary that he himself understand what he teaches if he is to find problems that will enable his students to develop the understanding they should possess. The teacher's understanding of what he teaches should in-

clude not only the underlying basic science and other principles involved, but also a knowledge of what constitutes the good practice, etc. Otherwise, he is handicapped in finding problems that he should use.

For group teaching, problems must be used that are of common concern to members of the group. Teachers who attempt to base their teaching largely on the problems of individual students experience some difficulty at this point—aside from having too few problems of understanding, trouble in arriving at *group* conclusions, and in having good sequence of problems. Also, they may not have the problems that will secure the learning the students need. These statements do not imply that problems used in teaching should never be the problems of individual students. Individual problems that are of common interest, if properly handled, may be used effectively in group teaching.

Lists of possible problems prepared by competent people may be suggestive of good problems to use in teaching. Also some books and bulletins are organized and written in such a manner as to be suggestive of problems. Generally speaking, however, the teacher must not expect to find his problems ready made nor will he find them in books; he will have to formulate his own problems.

Stating Problems. A person may have a problem that is not stated in words, just as he may have a concept or other generalization that is not verbalized (see page 126). Life presents us with many unphrased problems. However, if they are to be used in teaching, problems have to be stated. The teacher needs skill in stating problems and skill in recognizing good statements of problems. He cannot have these skills unless he knows that the difficulty in a situation sets the problem to be solved; out of it grows the question to be answered. In nearly all instances the problem should be stated as a question. It should be possible to answer the question only through

thinking. The situation or the setting of the problem, of course, is not a question but a statement of fact, though it may be considered part of the problem statement.

Problems should be phrased as the learners feel they should be, not as tasks set by the teacher for the learners to perform. Problems are not something just to be solved. In stating a problem, the teacher may very well ask himself, "How would people who have this problem state it?" A word of caution and suggestion here: An individual who has a problem usually states it in the first person singular. As it is his own problem, he uses the words I, my, and me. For group-teaching purposes —for problems of common concern to a group—the problem should not be stated in the first person singular. At least this is true if a group conclusion is to be arrived at and if the situations of the members of the class are different, as they usually are. In an application problem where no group conclusion is to be arrived at, the statement may very well be in the first person singular. The conclusions can then be as different as the situations warrant.

A good problem possesses certain qualities or characteristics which may be easily detected. The following six statements of criteria by which all problems should be judged before they are used in group teaching are but slightly different from those by Dr. W. H. Lancelot in his excellent book, *Permanent Learning:* [1]

1. The problem must be clearly stated.
2. It must be interesting. (For group teaching, it must be of common interest.)
3. It must call for thinking of superior quality.
4. It should be well adjusted to the ability of the class as to scope and difficulty.

[1] W. H. Lancelot, *Permanent Learning*, John Wiley & Sons, Inc.

5. It must be true to life in the sense that it must be a problem of the same kind that people meet outside of school. (Exceptions are problems used to secure understanding and the like, which most people in life do not concern themselves with.)
6. It must contribute effectively to the realization of the teaching objective which the teacher is striving to attain.

For a problem to be clear in statement, it must be readily comprehended and the conditions understood. The words used in the statement must carry the proper meaning to the members of the group; the question must call for the desired answer. Understanding a problem is a prerequisite to solving it; it is also necessary to interest in it.

Students cannot have a problem unless it is of interest to them. A problem implies interest, concern, appeal. A problem may be inherently interesting or it may be interesting because solving it will help develop an ability the learners want to acquire. But interest there must be. Among other things necessary for interest is acceptance of the conditions of the problem. A fairly common error in stating a problem is to include an assumption which has not yet been accepted. For example, in the statement, "How use the bluestone-lime mixture on tobacco plant beds?" the assumption is made (if the fact has not been accepted) that the bluestone-lime mixture should be used.

The interest must be thought-involved if one is to have a problem. Thinking of superior quality is reflective thinking; there are alternatives, a state of doubt, perplexity, mental difficulty. An act of searching is usually necessary to find the material that will enable one to resolve the doubt, dispose of the perplexity. Several or even many facts or principles are ordinarily involved. There are relationships to be seen. Thinking of superior quality is usually interfered with if the state-

ment of the problem is "double-barreled" rather than single. Examples of double-barreled statements are: "How plant and cultivate corn?" "How control insects and diseases, etc.?" when the control is not the same for both.

A good problem for use in teaching is neither too difficult nor too easy. If it is too difficult, the group will become discouraged and give up trying to solve it. If it is too easy, there is no reason for doing much thinking. No problem can be equally well adjusted to all members of a class. The teacher will simply have to make the adjustment as well as he can.

The scope of the problem is related to the difficulty, but the two are not the same. Scope refers to breadth. One convenient measure of scope is the amount of time needed to solve the problem. For example, if it will take about ninety minutes to solve the problem, from beginning to end, then the problem is of that scope. When the facts and relationships involved are too few or too simple and the time needed to answer the question is too small, there is no problem—only a question to be answered, perhaps a thought question.

"Trueness to life" refers to whether the problem will be met outside of school. How many of the group will meet it? If all of them will, the problem scores perfect on this criterion. Not all good problems used in teaching are met by many people outside of school, particularly problems of understanding. This fact should be considered in judging problems.

Reasons for the sixth criterion are stated on page 105. This criterion must never be overlooked in formulating problems.

Arranging Problems. It is not enough that the problems be well stated. A random collection of problems will not enable the teacher to succeed in using group problem solving. Good organization of subject matter is essential to good teaching. Such organization calls for problems of the proper type and arranged in the proper order for effective teaching, if problem solving is to be used.

Different types of problems may be used to accomplish different purposes. The teacher must know what he is trying to accomplish at each stage of his teaching if he is to have good problem arrangement—good series of problems. In attaining almost any fairly large teaching objective, the teacher will use problems for different purposes at the different stages of attainment. When the teacher's purpose is to establish a goal in the mind of the learners, develop interest in a particular "unit," come out with a bird's-eye view or introductory picture, or in any other way introduce a series of problems, his problem or problems should be designed to serve that purpose. Some such problems are usually necessary at the beginning of a series of problems. When the teacher's purpose is to develop an understanding or get principles mastered, the problem or problems used should accomplish that purpose. When his purpose is to develop a number of small abilities that go to make up a larger ability, the problems he uses should do just that. When creative abilities are to be developed, the problems used should contribute to developing them. Creative abilities include the ability to plan, to devise, to make or do something different or new, to invent, to put old things together in new ways. In almost any good series of problems, there should be some application problems where the students apply what has been learned in the series to their individual situations. Obviously these latter problems do not ordinarily permit of group conclusions.

In good problem arrangement, most of the problems grow out of preceding problems. For them to do so is of very great help to the teacher in getting the problems accepted by the learners. It also makes for good organization of subject matter.

Getting the Problem before the Class for Solving

The teacher has two main interrelated purposes to achieve at this point: to secure or to increase the interest of the stu-

dents in solving the problem, and to give some direction to their thinking as they solve it. (There may, of course, be more than one problem to be solved, although our discussion here is in terms of a single problem.)

"Motivating" the Problem. The first of the two purposes must not be overlooked. Students do not have a problem until it is of concern to them, until they accept it as their problem, until they think it is important and worth while, until they want to solve it. Without this concern and interest, any statement of a problem is only an arrangement of words.

There is no one way to motivate problems. As we continue to repeat, problems are different, groups of students are different. However, the teacher must be quite clear on a number of things that have a bearing on the reality of the problem. Some of these things we shall state or restate.

Problems do not exist separate and apart from situations. To have a problem, one must first have a goal—somewhere he wants to go, something he wants to secure or attain or possess or know or do or become able to do. Then, in attaining his goal, he must encounter a difficulty—a thing that blocks his progress toward his goal. If the difficulty is to be removed or overcome, it must be isolated, made clear as to what it is. The first step in solving a problem is to understand thoroughly what it is. When these facts are comprehended by the teacher, he has his first set of cues for motivating the problem.

All problems whose solution the students recognize as contributing to understanding or abilities they want to possess will be interesting to them. The teacher may need to develop concern for the new ability or understanding.

An excellent practice in motivating many, though not all, problems is to have the students state or help state the problem. If the students have encountered a difficulty in attaining their goal, they should be able to phrase or help phrase a

question which, when answered, will remove the difficulty. Encouraging them to do so not only recognizes that they are participants in the problem solving, but it increases their interest and almost guarantees that they will understand what the problem is. The problem will be clear to them, it will be worded in their language. Using this technique does not mean that the teacher meets his class unaware of what the problem shall be. To the extent that the teacher has isolated the difficulty met or to be met, he will know essentially what the problem is to be and have stated it as he thinks it should be stated. Then the students' statement of the problem, arrived at under the teacher's direction, will usually be very much like his own statement. The teacher will not be nonplussed in directing the learning process.

If the new problem has grown out of the preceding problem, as it often does in a good series of problems, the students will usually discover it and accept it. The new problem may even require a "charge of interest" to make it of greater concern to the group or to have it accepted by a few students who have not yet accepted it as their problem. At any rate, the situation is usually clear and the students themselves have encountered the difficulty and raised the question to be answered. If they were interested in the old problem, they will tend to be interested in the problem or problems that grow out of it.

To motivate a problem, the teacher should know what things people tend to find satisfying and what things annoying; he should make good use of natural impulses. This will help him to develop interest and to maintain it, and to avoid killing any interest already present. Some of these satisfying things and annoying things were listed in discussing the principle of effect (pages 19 to 20).

In motivating a problem, care must be taken not to solve it there and then. When the problem is solved, the difficulty is

removed and nothing remains to be done. If the problem is to be motivated, the teacher wants suspense aroused and maintained, not the removal of suspense.

Interest is contagious, like measles. If some of the students respond in an interested manner, it will be helpful in motivating the problem for others. Since interest is contagious, the teacher himself should be interested in the problem he expects the students to be interested in. If he has no enthusiasm for solving the problem, the students are not likely to be enthusiastic. Solving the problem should be a mutual undertaking, involving the interest of both students and teacher.

Encouraging the students to offer tentative solutions is often an excellent way of increasing the motivation in a problem. Let the hypotheses come out into the open, with some exchange of opinion among the students. Permit even wrong hypotheses. These tentative solutions, where the problem or aspect of it permits, increase general interest in the problem. They make the problem clearer, offer cues for its solution, and tend to create suspense. Many students are left less confident of their solutions since perhaps only one solution can turn out to be right or the best one.

When Problems Tend Not to Be Recognized. If one is to solve a problem, he must encounter a difficulty which he wants removed and he must try to remove the difficulty. The teacher should understand the conditions that make for *not* recognizing problems. Here are a few of them:

1. When one lacks confidence that he can solve the problems. Where the obstacles seem too difficult or too baffling, one tends to give up, back off, do something else. Failure in solving problems tends to destroy one's confidence in his ability to solve them. Success has just the opposite effect.

2. When habit takes care of the situation (be it well or poorly from another's point of view). Habit is an automatic form of behavior, not a problem-solving form.

3. When one is in the realm of the too familiar. The familiar tends not to present problems. People tend to be satisfied with what they have and what they do; complacency is the rule. They tend to be apathetic when considering the familiar. People tend not to give attention to what is before them rather constantly. The old, the accustomed, does not furnish the material for a problem but for its solution. Something remote must supply the stimulus and the motive—a goal perhaps. Imagination must supply the remote.

4. When the shifting of the mental set is too hurried. One usually wants to do what he is doing. To interfere with what one is doing tends to be annoying to him. Teachers should not expect students to shift their mental set too quickly, to take on instantly concern for solving a problem when the students have a mental set toward something else—perhaps some other problem of theirs.

Analyzing the Problem and Giving Other Direction to the Thinking. After the problem has been properly motivated, students often need some help in their attack on the solution of it. The nature and extent of the help depend upon the problem and the students. Students do not need help in doing what they can very well do without the help. But those things that stand in the way of solving the problem should be removed.

In most problems of considerable scope the students will need direction from the teacher in analyzing the problem to see how to solve it (see illustration of an analysis, page 98). The analysis of the problem or any other step in solving it should not be undertaken until the students are interested in solving the problem. Only when one has a problem can he ask how he is going to solve it. In most problems the solution hinges on a few big things or factors to be considered. These should usually be drawn from the class and listed on the board, making sure that the students see how each thing or factor listed must be considered in solving the problem. These

points or factors to be considered should be expressed in as few words as possible, and not in question form. With some problems and some groups, the group or class as a whole does not need to analyze the problem; each student can make his own analysis.

If the students have a problem, careful analysis of the problem will show them what information they need and why they need it. Students are not only to look up information, but they are to find the information because they need it to solve the problem, and they are to *use it in solving the problem.* Often students fail to apply themselves in solving a problem because they have encountered no difficulty which they feel needs to be tackled, or the problem has not been analyzed clearly enough for them to see how to go about solving it.

Technique Suggested. In analyzing a problem with the class —after it has really become a problem to the class, and perhaps the possible answers or hypotheses have come out into the open—the teacher may very well ask some such question as: "What things will have to be considered in solving this problem?" Or if the students understand the term, "What factors will we need to consider?" Or if there has been considerable argument as to which of the possible solutions is the best one, "How are we going to find out which is right?" There are many good ways to ask the question. There are also some poor ways such as, "What is the first thing we will need to consider?" Students usually respond better when asked, "What things need to be considered?" than when asked to name the first thing that should be considered.

In listing on the board the things or factors to be considered, a good technique is to make a temporary list first, listing the items in the order they come from the class. List no item unless the students see how it has something to do with solving the problem. If explanation is needed, the student

who suggested the item should explain to the class why the item must be considered. After the teacher has drawn from the students as many as possible of the things that will have to be considered, some of the necessary things may still be lacking. Perhaps a well-phrased question by the teacher will cause the students to think of a missing item and suggest it. As a last resort, the teacher may have to suggest any missing item or items and show the group why they will need to be considered in solving the problem. When the group sees that an item must be considered, it can then be added to the temporary list.

When the temporary list of things to be considered is completed, it should be gone over carefully by the group to improve the wording if possible, to see if there should be any combining of factors or any discarding because of duplication, and to arrange the factors in the best order for solving the problem. The list then becomes the accepted list of things that will be considered and perhaps now should be written directly under the statement of the problem.

References to Be Used in Solving the Problem. Much difference of opinion exists as to how far the teacher should go in suggesting the exact references that will be helpful as sources of information in solving the problem. Certainly the student should learn to look up information for himself; he should learn to do without the teacher. If beginning students are taught how to find information, however (including how to use the library and how to use the table of contents and the index in a book) and if the students have plenty of practice in looking up things for themselves in solving their individual problems, there is good reason for suggesting most of the references and their pages in group problem solving. Doing so saves much time and helps ensure that the problem will be solved by most of the students. It also helps prevent the problem from becoming one of where to find the information.

Obviously if the students can find the needed information surely and quickly, there is no point in suggesting where it may be found.

Effective use of problem solving in teaching agriculture requires a good library, up to date and properly catalogued. A good library consists of books and bulletins, including circulars and leaflets and such other publications as furnish the usable information. Students cannot solve problems "out of thin air." Nor can the teacher of regular school groups supply much of the information directly and do a good job of teaching; the students are robbed of a necessary self-active process. A badly out-of-date library is perhaps worse than no library. A "pile" of books and bulletins does not constitute a library. The publications must be filed so that what is wanted may be found.

Directing Students in Solving the Problem Individually

Any group thinking on the method of solving the problem has now been done. Usually at this point, with a regular school group, each student solves the problem for himself. He is supposed to solve it, that is his responsibility. His job is to find the information he needs and solve the problem. He is to come out with a conclusion which he believes to be a good one. If necessary, he can tell the class how he arrived at his conclusion. In certain groups, such as an adult-farmer group, class members usually do not solve the problem individually.

Whether or not this phase of problem solving is done under the direct supervision of the teacher will depend on such factors as the amount of time available and the library facilities in the agriculture room. This phase is frequently referred to as "directing study." Notice, however, that the study consists of solving a problem. It is not a matter of reading so many pages or copying answers to questions or engaging in some form of "busy work." The student has a problem to solve;

he is studying in order to solve the problem. The teacher is continuing to teach, continuing with problem solving.

Students should be held responsible for doing what they are supposed to be doing: solving the problem. It is not enough that they find the needed information and read it; it is not enough that they solve *part* of the problem. Each student is to find the information he needs to solve the problem and to use it in solving the problem; he is to come out with a conclusion to the whole problem, verified to the extent possible; and he must be ready to explain how he arrived at his conclusion.

Some Teacher Responsibilities. The teacher's over-all responsibility in directing the students in solving the problem individually is to guide or direct the students in solving the problem, each student for himself. The teacher should devote his allotted time to this purpose rather than try to do something else while the students solve the problem. Things will not "just take care of themselves" at this stage in solving the problem. Here are a few responsibilities, implied or stated as such, which the teacher should not overlook:

1. Students have to be *taught* to solve problems instead of just studying. Students who have always recited lessons should not be expected to know how to solve problems—how to hold the problem in mind, how to find the information needed and separate it from what is not needed, and how to put the facts together in such a way as to solve the problem. They have to practice doing these things until they learn them. This practice the teacher must supervise.

2. It is the teacher's responsibility to make the physical conditions in the room favorable to study—temperature, light, noise, etc. Students should share this responsibility.

3. The sources of information needed to solve the problem should be accessible. Students cannot "make bricks without straw."

4. Any student may run into an obstacle in solving the problem which, if not removed by the assistance or direction of the teacher, may make the problem impossible for him to solve. The teacher should be on call to render such service.

5. In most groups there are some students who cannot solve the problem nearly so quickly as the others. The teacher should devise ways of helping these "slow" students. There are many possible things to do here. Sometimes the slow student is slow because he reads poorly, yet has the capacity to learn to read well. Maybe the agriculture teacher can teach him to read or get some other teacher in the school to teach him. Often the teacher can assist the slow reader by tactfully suggesting that a certain reference is a good one to read first. Sometimes the teacher can speed up the process by asking the student a question that will cause him to see a necessary relationship which he would otherwise fail to see or be a long time discovering. Sometimes slow students are slow because they have not yet been taught to solve problems (see item 1).

The teacher does not want to single out the slow students and make them more aware of their shortcomings. Generally speaking though, anything the teacher can do to make the slow students succeed will be encouraging them and will generate in them more energy with which to work. Making use of a slow student's contribution during the discussion, calling on him early in the discussion when he can still make a contribution; recognition in any form is likewise encouraging to him.

6. There are also students in a group who solve problems much more quickly than the others. These students should never be penalized for their speed. The world pays for speed as well as for quality of work. The teacher has a responsibility here, lest the fast students with time left over become loafers. They should be kept busy doing things worth while

to them. There is no end to what these things may be. Always, of course, students should have the privilege of further reading or investigation and experimentation. They should be encouraged in this. Often the teacher may suggest for the brighter student a more advanced reference on the problem, if the student would be interested in it. Then the teacher can reward the student by making use of his findings during the group discussion later. Rather than loaf, the bright students may be encouraged to use their extra time on such individual agricultural problems as they may have. These problems may relate to their farming programs or to anything else.

7. Some students stop working but the teacher suspects they have not solved the problem. Now the teacher does not want to become a policeman. However, he often can render these students a service by doing such things as asking them what conclusion they have come to and perhaps some question on how they arrived at it. In one way or another students should be held responsible for doing what they are supposed to do.

8. The teacher should display an attitude of helpfulness. Such an attitude generates confidence and interest in the students. The attitude of helpfulness must not result in doing the work for the students or in interfering with their work. Both of these are vices.

Student Writing. How much writing or note taking the students should do in this phase of problem solving is a debatable question. Perhaps, generally speaking, they should write only what they need to write in order to solve the problem, and that on scrap paper. Obviously, if solving a problem calls for preparing a statement, making a drawing, performing a calculation, or filling in a form, this should be done.

It is doubtful if high-school students should take permanent notes from their reading during problem solving, unless

certain materials have been decided on in advance. They make too many mistakes, copy too much irrelevant material. As an example, this statement is taken from a boy's notebook, on the place of cover crops in farming: "Lespedeza is a good leaching crop, because it stops growing early in the fall and decays so that it soaks up the minerals as it passes through the ground."

Often the students should be asked to prepare written conclusions to the problems they solve individually and perhaps to arrange the reasons or facts in support of their conclusions. This is not only helpful to the students directly, but it should enable the teacher to check on the thinking process by which the student arrived at his conclusion so that he may correct his deficiencies.

Amount of Time Needed. The question is often raised as to how much time should be allotted for the students to solve the problem individually, under the supervision of the teacher. Perhaps the answer is: Enough time to enable the students to solve the problem. The teacher cannot afford to wait until every student has solved the problem. Too many students would be bored waiting; too much time would be wasted. The teacher will have to be the judge as to when to bring the individual problem solving to a close. Usually most of the students should have solved the problem, but not all of them. Generally speaking, it will take approximately as long for the students to arrive at their individual conclusions as it will later take to arrive at the final group conclusion through class discussion.

Teacher Supervision Not a Necessity in All Problem Solving. The teacher may use problem solving in teaching without supervising the solving of problems by the individual students. As we have seen, in adult-farmer groups the class members do not ordinarily solve the problems individually. In still other classes, the students may do their preparation outside

the classroom without the supervision of their teacher. This situation does not preclude the use of problem solving in teaching.

Bringing the Problem to a Conclusion

The final group conclusion is arrived at by discussion. This is the second phase of class discussion, getting the problem before the class for solving being the first phase. Students and teacher now arrive at the best solution to the problem, the correct solution if possible. But much more is desired than a sound conclusion. As always, the teacher should be concerned with teaching. In arriving at a final conclusion, an important purpose of the teacher is so to direct and check the thought of the students as to get good thinking done. Problem solving is a thinking process. Effective use of problem solving in teaching secures good thinking by the students. Bringing the problem to a conclusion is the teacher's opportunity and his challenge in teaching. It is a most important task and requires a high degree of skill. The teacher is responsible for the success of the undertaking. He must give it the proper direction and guide the thinking processes of the students, tactfully revealing or having their errors revealed to them, patiently fostering the development of sound mental habits, earnestly searching for the truthful answer to the problem-question, and diligently teaching the agriculture that needs to be taught.

No one method or technique is suited to arriving at the conclusions of all problems or with all groups of students. This is indeed fortunate; it leaves plenty of opportunity for the use of intelligence by the teacher. Method must never become a substitute for intelligence.

The general technique outlined below can well be used with a regular school class in arriving at a group conclusion to a whole host of "decision" or "choice" problems such as these: What hay crops should we grow? When shall we

breed our sows for spring litters? Which is the best type of hog house for us to use? Shall we full-feed our pigs? Does it pay to feed minerals to hogs? Is corn alone a good feed for any of our farm animals? How much will cotton be likely to bring this year? What should be our egg-production goal? Which is the better of these two rations for dairy cows (of two rations proposed)? In these problems in production the gist of the conclusion can usually be put into a single statement regardless of the number of amplifying or qualifying statements that may also be needed. Although several factors are considered in solving each of these problems, the conclusion is a single concept or thought and is not the sum of the factors or parts considered. The conclusion to such a problem is not what is found out about factor 1, plus what is found out about factor 2, plus what is found out about factor 3, and so on. Since the gist of the conclusion can be put into a single statement, a well-formulated conclusion will begin with this statement. The conclusion, of course, is not always a verbal statement; it may take the form of a table or graph, as might be the case in arriving at the planting rate of corn for soils of different fertility.

General Technique for Arriving at Conclusion

1. Find out which students hold what conclusion. This may be done by collecting written gists of the conclusions or it may be done by the teacher's stating one of the alternatives and asking, "Who came to that conclusion?" then another alternative, and so on until all students have committed themselves. It may also be done by calling on several students to state their conclusions orally and seeing which students agree with each stated conclusion, until all students in the class have committed themselves. The teacher will know still other ways of finding out who holds what conclusion.

2. Select one of the proposed conclusions and call on a

student advocating it to give his reasons in support of his conclusion. In no case should a "yes" or "no" or other single word, such as a number or date, be accepted as a conclusion when it is not properly supported and adequately amplified as to exceptions, conditions, etc. The student's reasons in support of his conclusion should be given to the class, not to the teacher. After the student has finished his statements, but not until then, other students should evaluate what he has said as to whether the facts were correct and relevant and properly used. As significant facts are agreed on by the class, they may be written on the board.

3. Call on a student who arrived at a different conclusion and ask him to state his conclusion and give his reasons in support of it. Proceed as in item 2.

4. Continue with other students until the significantly different conclusions are before the class and checked as to their soundness.

5. If further evaluation of the facts or arguments is needed, guide the class in making the evaluation. Up to this point, encourage suspense. Frequently, by this time, most of the facts, if not all of them, have been agreed on and their significance seen, and the answer to the question is emerging and being accepted by the class. When the group is really ready to agree upon a sound conclusion, encourage them in doing so.

6. After the conclusion is no longer in doubt, lead the class to formulate such a statement of it as seems warranted. There is such a thing as an unverbalized conclusion—a conclusion seen and accepted but not worded. In life outside of school we act on many of these conclusions or generalizations and find them functioning and vital. We often make decisions without wording them, often do things without stating verbally how we shall do them. In arriving at a conclusion to a problem in teaching, it is possible to spend so much time in getting the conclusion stated, after it has become evident to

the class, that learning is seriously interfered with. It is suggested that, after the conclusion (or generalization) has become evident and accepted by the class, the teacher use whatever devices he can to speed up the wording of the conclusion, lest the vitality of the unverbalized conclusion be destroyed. When stating the already accepted conclusion becomes a long-drawn-out or tedious and awkward process, the internal dynamic learning may be wiped out instead of fostered.

The wording of the conclusion may be speeded up by accepting a reasonably good statement of it which a student has already made, revamping the statement by the class only to the extent necessary. Or in some instances the teacher may suggest a wording which he believes represents the agreement reached, asking the students if the statement is the conclusion. Still other methods of getting an acceptable statement fairly speedily will occur to the teacher.

7. The conclusion to an agricultural problem should usually make clear or be followed by applications to be made of it or practices to be carried out. (Often one or more problems of application should be used.) Generalization should be sought by the teacher. Also, the practices need to be carried out if the teaching is to be complete. Practice is essential to learning. There is always the danger that thinking will lead to no action, become an end in itself. When this happens in agriculture, the teaching falls flat, the problems might as well not be solved—the real obstacle to the farming goal, if not to the thinking, remains. Apparently, the fact that the obstacle to the farming goal is still to be removed in practice is one of the virtues of using problem solving in teaching. It prevents the feeling of having finished, completed, left the problem, and is conducive to learning.

The general technique just outlined, with but slight adaptation, can also be used in bringing to a group conclusion

nearly all of the typical "how" problems—those problems people meet when they must work out or learn a procedure for doing something they want to do. The "how" problems include such problems as these: How should pigs be castrated? How get a stand of alfalfa? How sharpen a crosscut handsaw? How balance the concentrates to be fed dairy cows in production when not on pasture? How cull the laying flock? How build up the fertility in this field?

The conclusion to most of the typical how problems consists of conclusions on a series of steps. The total conclusion is the sum of the smaller conclusions, the sum of the parts or steps. Take, for example, the problem, How should pigs be castrated? The steps by which to arrive at the conclusion to this problem might be these:

Age to castrate
Method of castration to use
Care of pigs just before operation
Performing the operation
Care of pigs just after the operation

If these are the five essential things to consider in castrating pigs, then the conclusion to the problem is the sum of the decisions on these five things. Bringing the problem to a group conclusion, *after the students have solved the total problem individually*, might very well be done by following the general technique already outlined. The only adaptation necessary is to arrive at a conclusion on one of the steps at a time. For example, in this problem arrive first at a conclusion on the age to castrate pigs, then arrive at a conclusion on the method of castration to use, and so on until the five decisions are made. When the conclusion on the last step has been arrived at, the total conclusion is finished; it is the sum of the decisions, the sum of the parts.

The Use of Questions in Problem Solving

In every phase of problem solving in teaching, the question has a frequent and important use. It is used in getting the problem before the class for solving, which may include analyzing the problem; in directing the students in solving the problem individually; and in bringing the problem to a conclusion. It has a very important place in both of the discussion phases of problem solving. The teacher must be able to use questions effectively in teaching. The ability to formulate and ask good questions is the most useful single ability a teacher may possess. The art of questioning is developed only through practice. But the teacher should understand the nature, function, and use of questions in teaching, as a background for developing this art.

Most questions in ordinary life are asked in order to get a response that will satisfy one's own needs, to get information or action useful to the asker. In such cases, generally—except as a matter of tact and human relationships—one is not directly concerned with the effect of the question upon the person asked. On the other hand in teaching, the teacher asks questions to get a response that will be useful to the student or students, not to satisfy his own needs. It is not for the teacher's sake that he asks questions. Questions are used in teaching primarily in order to direct the students. Their purpose in teaching differs from the purpose in ordinary life. The teacher must be very clear on this fact. It probably accounts for a large part of the difficulty of mastering questioning in teaching. For years before one becomes a teacher, he has asked questions when he needed information. Now he desires to ask questions for teaching purposes, something different from what he has been doing; he must acquire another outlook and new sets of habits. No wonder it is difficult for him.

Relation to Self-activity. Learning is a self-active process; one learns through his own activity. The teacher uses questions to stimulate or provoke a thinking activity. But self-activity does not necessarily result in learning. The man answering my questions in ordinary life is engaged in a self-active process. Responding to questions in a classroom may be merely busy work, or worse. The process may be only one of memorization, regurgitation. The teacher must know what activity he desires on the part of the students, in order that the intended learning may be promoted. The test of his success in questioning will be whether, for the sake of its effect on the student, he secures that kind of response.

Some Characteristics of Good Questions. A good question is not merely a matter of the form in which it is put. The question must be good for the purpose, good in getting the intended action by the student or students. It is possible, however, to name some general characteristics of good questions in teaching. Here are a few of them:

1. The question should be a communication between the teacher and students. A communication implies a common basis of understanding, "speaking the same language." There is no communication when the teacher "shoots over the heads of the students," when the words he uses do not carry the proper meaning to the students in terms of their learning and experience.

2. The question should be so worded and should be spoken so clearly that no repeating of it is necessary.

3. Good questions lead the thinking forward step by step. There is usually a necessary sequence to good questions. Some other sequence would not do; it would lead to confusion rather than understanding.

4. Generally speaking, questions should be fairly specific. "What pasture grass did we discuss yesterday?" is a more specific question than "What did we discuss yesterday?" or

"What do you remember about the lesson we had yesterday?"

5. For group teaching, the question should stimulate activity in all members of the class. This principle is violated when the question is directed to one student, as it is when his name is called before the question is asked. It is also violated when a student is called on so soon after the question is put that the class members do not have time to start to answer it mentally.

6. Since the purpose of questioning cannot be separated from the characteristics of good questions, the answers which the questions elicit from the students and treatment of the answers by the teacher have a bearing on the success of using questions. In group teaching, replies by the students should be addressed to the class rather than to the teacher. Also, the answer of each student deserves consideration by the teacher and other class members. One of the marks of a skillful teacher is the use he can make of a student's contribution.

7. Good questions and proper handling of the answers should evoke questions from the students. When questions by the teacher raise eager and intelligent questions by the students, the teacher's questions are likely to be good ones.

The Place of Laboratory Exercises in Problem Solving

The laboratory as such has fallen into disrepute in teaching agriculture below college level, also to a great extent on the college level. There seems little justification for having farmers or would-be farmers do individual laboratory exercises. In teaching facts or principles by using apparatus or equipment, demonstration usually saves time and materials, is more accurate and more interesting than individual laboratory work, and is productive of more learning (see discussion on directing observation, page 36). Many facts and principles can be demonstrated to better advantage under field or farm conditions than in a school laboratory. Whether demonstration can serve the purpose or whether there is need for individual per-

formance in order to acquire individual skill or get experience with things, the laboratory work that can be justified should usually have a problematic aspect. The students should have a desire to find out what they do not know or to acquire an ability they do not possess. The problem should be the source of their motivation. Problems, of course, may grow out of students' interest, desires, or even curiosity, but they cannot be expected to emerge from the old mystery procedure, "Follow the directions explicitly and note the results carefully." Laboratory work that has no connection with problems to be solved is likely to be mere busy work. When it is used, laboratory work should be a part of the process of solving problems. It should not be run on a separate track.

Adapting Problem Solving to Various Groups

Problem solving may be used with any group in teaching agriculture, from grade-school pupils to a college class. It can be used when the solutions of the problems are to be arrived at by the students working individually by and through the reading they do on it, whether the reading is done in the agriculture room under the supervision of the teacher or in some other place without his supervision. It may be used when there is no reading by the group members in solving the problems, as is usually true with adult-farmer groups.

If a teacher has mastered problem solving in teaching one group, he usually has little difficulty in adapting his general procedure to another group. He already has a concept of the central feature of the method; that is, a problem or problems are to be solved, not a recitation conducted or a lecture made. He knows that problem solving involves the devising of good problematic situations, the presentation of their problems to the class, and the solution of them by the class individually or as a group.

The adaptation to be made is not very complex. This chapter has presented, in some detail, a procedure that may be used in teaching a regular school class where the students are expected to solve the problems individually before the group conclusion is arrived at under the direction of the teacher. With regular classes there is usually plenty of time—months of it—the students read as a matter of course, and the scope of the problems can be relatively large, teachers often preferring a full class session for each problem.

The essential things to be done in adapting problem solving to a particular group would seem to be about as follows:

1. Adjust the scope of the problems to the level of the experience and understanding of the group. Scope includes not only complexity or breadth of the problem in the usual sense, but it has to do with amount of time necessary to solve the problem. The amount of time it should take to solve a problem depends in part on the training and experience of the group in the subject and on the reading to be done. Where members of the group possess most of the information necessary to solve the problems, problems that would otherwise be somewhat large in scope can often be solved in a short time. This is usually the case with adult farmers. With adult groups, some teachers prefer to use problems of such scope that several problems can be solved in one class session.

2. Go only as far as necessary for the particular group in analyzing the problem with them to see how to solve it. If the members of the group are not to solve the problem individually, analyzing it with the group is not always necessary before starting to solve the problem. As a rule, the smaller the scope of the problem the less the need for analyzing it under teacher direction. In teaching adult farmers, no analysis of each problem is made if several small problems are solved in one class session.

3. Only when the members of any group cannot secure or supply the information needed to solve the problem should the teacher himself supply it. Where reading is done by the students in solving the problem individually, references should usually be used as the chief source of information to be gathered. In adult groups there is usually no solving of the problem individually and no reading. Adults have a wealth of information and experience. The teacher, then, is wise if he supplies only the *additional* information needed to solve the problem and supplies it after the farmers have made all the contributions they can make.

4. Formulate only such conclusions as are warranted with the particular group. With regular school students it is usually desirable to come out with well-written, agreed-on conclusions. With adult groups the conclusions may be very informal, often only an oral statement by the teacher of what "seems to be our conclusion" or the answer to the question. Usually, however, if certain concrete things have been accepted, such as a spray schedule or a mash formula, they should be worded clearly and plainly, often on the blackboard, and perhaps duplicated in some manner for the members of the group.

Generally speaking, the more mature the students, the more capable they are at solving problems. Adults can do much better than young boys. They have a greater range of experience, better understanding, and a larger fund of well-developed, functioning concepts. They are more able to comprehend the nature of their difficulties. They have greater critical judgment and are able to take a more objective attitude toward problems.

Teaching adult-farmer classes and young-farmer classes is discussed in Chaps. 10 and 11.

Making the Lesson Plan

Using problem solving in group teaching requires careful lesson planning. The teacher who goes before his class without a plan for teaching is not likely to do much teaching. Problem solving is not just taking any problem that happens to come up and discussing it without the teacher's having thought through what shall be done and how it shall be done.

Problem solving in group teaching depends heavily on discussion. A good discussion is a difficult procedure to direct and requires careful planning. If much learning is to result from the procedure, a definite plan is even more necessary than for most other forms of teaching. Without a good lesson plan, the problems are likely to be poor for teaching purposes, and digression from the subject or problems, guessing, irrelevancy, and hodgepodge may be expected because of poor direction by the teacher. The plan is the basis for control or guidance. It serves to prevent digression and shows the way back if digression should occur. The planned problem determines the *relevancy* of facts, experiences, and opinions. It prevents hodgepodge, because the plan is a system. The plan provides for controlled student participation, controlled freedom (the only real freedom there is), which avoids domination and participation by a few and ensures consideration of all and active participation by all.

The form of the lesson plan for using problems in teaching is relatively simple; there is nothing formal about it. It can be made as brief or as complete as is needed to help the teacher in his teaching. The following things to include in the lesson plan seem rather obvious:

1. Statement of the problem or problems. If the problem is still to be got before the class, any notes that will be helpful to the teacher in causing the problem to emerge or in motivat-

ing it are also in order. The problem or problems should be stated before the teacher meets the class even though the statements may be slightly changed later.

2. Analysis of the problem. This results in a list of the steps to be taken or the things or factors that will need to be considered in solving the problem, the demands the problem will make of the class.

3. If teacher contributions of factual material or authoritative opinion are to be made—as will be especially necessary in adult classes—such notes on these as will help the teacher should be included in the plan. Some of this material may need to be in the form of charts or slides; it may be duplicated to pass out to the students, previously put on the board, or made easily accessible to the teacher in references to read or quote from.

4. Specific page references to information useful to the students in solving the problem. These are needed by the teacher whether or not the students are given the specific pages.

5. Such a statement of the conclusion to be arrived at by the class as the teacher deems necessary to have. Before the teacher meets the class, he should have gone over the ground mentally and know the conclusion that he and the class will be justified in arriving at. Otherwise "the blind is leading the blind" in solving the problem.

Using Individual Problems in Teaching

Most of the discussion in this chapter has been in terms of group problem solving, by which is meant that all members of the group solve the same problem and at least some group work is done. Problems that should be used in group teaching are of concern to all or nearly all members of the group or class; they are of common interest. In an individual problem, as the term is used here, the problem solved by each student

is different from that solved by the other students in the class. Each of these types of problem has its own merits and advantages. Group instruction is more economical, aside from its other advantages, in securing learning which all the students should acquire. Public education is made possible largely because students can be taught in groups. However, there is a definite place for the use of individual problems in teaching agriculture, particularly vocational agriculture in the high school and with young farmers. Students do have problems which are different from those of the other students; they do have problems that are not common to the group. In vocational agriculture most of these problems grow out of the farming programs of the students, but not all of them. Setting aside regular days during which each student may work on the problem or problems of his choice saves time for the teacher and helps prevent "dragging" problems before the group that are not of common interest. Many teachers have individual-problem days and can well justify them.

Making good use of individual-problem days requires careful planning. The teacher's role is still that of teacher. He must give the proper guidance and direction to each student. This he can very well do because not all the students will need his help at the same time. He may have to master certain techniques, but he can master them.

If the teacher is to succeed in using individual problems in teaching, he and the students must get into the spirit of it. There must be problems to solve on the individual-problem days. In order to have them, the students should be encouraged to jot down the individual problems they want to work on at any time the problems are discovered, perhaps in a designated place in the notebooks. A student may discover a problem for himself during the solving of a group problem, in planning or carrying out his farming program, during the teacher's supervisory visit, in his general reading—anywhere,

any time. Teachers should help students discover problems, especially in the realm of the too familiar to the students and in the realm of the too new. Students are not as a rule experienced in discovering problems to solve at school. If all students write down the problems they wish to work on, no student should be without a problem when an individual-problem day arrives. These days should be frequent enough so that interest in solving individual problems is maintained.

A few students may not have problems they want to work on when the time comes. The teacher may then have to set a problem for them. A problem may be set for another in the same sense that a task may be set. When there is concern in removing the difficulty provided, it is a problem. If the teacher does not succeed in setting a problem for the student, he is justified in setting a task for him and holding him responsible for doing the task. This will be no worse than students' doing other tasks under the name of teaching, and may cause the student to discover a problem he will choose to work on next time.

Seldom should the results and procedure followed by the student in solving an individual problem be put before the entire group. The problem was not of common concern to start with, and it is not likely to be after it is solved.

Some Limitations in Using Problems in Teaching

The term problem solving, as used in this book, is not so broad as to be synonymous with learning. A problem implies a difficulty to be overcome by discovering and using meaningful relations. The teacher and the learners should be concerned with some learnings that are not attempted through problem solving, and with other learnings that will not be acquired simply or wholly by the process of solving problems unless special effort is made to have them acquired. While the good teacher of agriculture should center his teaching in

problems, he should be aware of certain limitations that problem solving in teaching may have.

In a problematic situation the learner wishes to reach his goal; he may wish nothing more. The only understanding he wishes may be that which is essential to his goal-achievement. No other understanding can be counted on unless the teacher makes an effort to secure it. It is a mistake to assume that just solving a problem will always secure all the understanding which the situation and the capacities of the learners permit. Learning does *not* always proceed with full understanding or even with a desirable amount of understanding. But securing understanding is essential to most good teaching. The teacher may need to face the task of developing in the learners a desire to understand what lies beyond the reach of their own immediate goals. Such understanding may indeed be a separate goal calling for a separate problem, or at least the goal or objective may become different from what it otherwise would be. There are, of course, problems the purpose of which is to promote understanding, and the teacher would do well to use many of them in his teaching. (For a discussion of understanding, see pages 44 to 46.)

Nearly every statement just made about securing understanding can be made about securing generalization. Stopping after the solution of problems is likely to leave the students short on generalization, except of course in the case of problems whose solutions are generalizations. This fact is one of the most important and most neglected limitations of problem solving as practiced. The teacher must see that the students generalize. Generalization is discussed in Chap. 2.

Certain useful facts and concepts must be stressed or emphasized more strongly in teaching than the allotted problems usually provide. The use of a fact in solving a problem may not be enough to get it learned. The fact may need to be

singled out, emphasized, caused to be learned intentionally, its significant relation to other facts or truths made clear.

In the practice necessary to attain a manipulative skill, usually the problematic aspect soon disappears. No problem is found in each successive operation. The response is without consideration of alternatives. The process becomes one of habit formation—acquiring automatic responses.

One may not have a problem of enjoyment or appreciation, such as that of a beautiful picture or sunset or poem or landscape or field of grain. Enjoyment or appreciation here has no element of problem solving. In fact, make of it a problem activity and the enjoyment is likely to be lessened or destroyed. Yet there is a place for enjoyment or appreciation in teaching agriculture.

Occasionally there may be a place for memorization learning. The only way one can learn to say a poem or a creed is to memorize it. Obviously, memorization is not problem solving.

CHAPTER 6

DEVELOPING MANIPULATIVE ABILITIES

Many of the abilities in farming are manipulative or manual in character. They involve use of the hands and other parts of the body, overt physical activity, regardless of the amount of mental activity used. Manipulative abilities are important to success in farming, though it is easily possible to overstress them as determinants of success in operating a farm. The agriculture teacher is concerned with developing manipulative abilities or skills in his students. He should be aware of the fact that securing this kind of learning makes use of all that is known of how learning takes place. It is learning; therefore the principles of learning apply. Almost everything discussed in Chap. 2 on the learning process bears on this form of learning, as do the discussions in the chapters on teaching objectives, constructing the course of study, and using problem solving in teaching.

Relation to Teaching Objectives and Course of Study. Obviously the manipulative abilities to be developed in the course should be included in the teaching objectives and course of study. The *abilities to be developed* are the teaching objectives, not the things that are to be made by the students or other work to be done by them. Merely listing the manipulative abilities is not to be clear about the teaching objectives. The degree of skill or proficiency to be attained is part of the objective and varies with the purpose of the skill. It has a bearing on the justification of the particular objective, on the amount of

time it will take to attain it, and perhaps on the equipment and facilities needed for developing the ability. For example, cabinetmaking ability in the use of a handsaw is a very different ability from that needed to saw boards for fences or rafters, joists, and siding for ordinary farm buildings. Attaining the two abilities constitutes two very different objectives. Different needs are involved, different standards of workmanship, different training situations.

Having in mind the students in his class, the teacher must ask himself what manipulative abilities are relatively significant for these students to acquire—compared with other manipulative abilities that might be developed and other kinds of learning that might be done instead. In this connection he must consider the abilities that will be picked up by the students anyway and the abilities for which reliance on experts may be the desirable procedure. Developing these abilities does not justify use of teaching time.

Relation to Problem Solving. To the extent that students are acquiring manipulative abilities they want to acquire, the lack of which prevents their doing things they wish to do, they are solving problems of a kind. To be sure, verbal conclusions may not be arrived at or, if they are arrived at, they do not represent the manipulative ability. This is for a very good reason: although thinking usually enters into manipulations, a manipulative ability is not just a mental process. It involves the kinesthetic sense whose nerve endings are in the muscles, tendons, and joints (see page 143). Words cannot express one's manipulative ability, or perhaps any other ability for that matter.

Many of the attempts in school to develop manipulative abilities that do not have problematic aspects result in mere busy work. There should be present not only the problematic aspect of concern and "difficulty met to be overcome," but thinking must usually be done in acquiring and using the

manipulative skill. Manipulation and thinking must be taught together. Difficult standards of performance cannot be attained without thinking. In fact, they are a demand for thinking. Seldom does one perform a complex manipulative skill well unless he "uses his head." All around us we see illustrations of what happens in performance when people do not use their heads.

Some Special Aspects and Factors in Manipulative Learning

Manipulative learning refers to the acquiring of manipulative or motor or muscular skills or abilities—all names for the same thing—in which muscular or physical movements are a definite part. It involves learning to do—acquiring sensorimotor coordination. Practice is necessary in order to acquire the coordination needed for motor skills. (Practice is never mere repetition.) Successive attempts or trials must be made. In simple instances one might be able to prevent gross errors in the first attempt, but speed and precision would be lacking, coordinations would not be there, skill would be absent. The efforts of the beginner are poorly coordinated; they are awkward and ineffective. This is normal; it should be expected by the teacher.

Role of the Kinesthetic Sense. One has a sense in his muscles, tendons, and joints that makes him sensitive to his own movements, just as he has the senses of sight, hearing, taste, smell, and touch that make him sensitive to the behavior of others. Kinesthetic refers to the sense whose end organs lie in the muscles, tendons, and joints and are stimulated by one's own bodily movements and tensions. The kinesthetic sense directs and controls the motor skills more than does any other sense. It reports bodily movements and makes precise coordinations possible. We depend on this sense to get the "feel" of a thing

—the proper grip, or hold, or stroke, or swing, or pressure, or what not. It is different from the sense of touch.

If you are not yet clear that one depends on the kinesthetic sense for coordinations and the like, reflect on the many things one can do quite independently of the usual five senses. One can ride a bicycle or swim (except for the danger of bumping into things); he can estimate weight or distinguish differences in the weight of objects; he can touch the ball of his thumb with either of his fingers; he can milk; he can tell the consistency of a substance he is stirring, or the hardness or toughness of a thing he is cutting or breaking or pulling apart. Do you depend only on the sense of sight or touch when you use a hammer or a saw or when you perform any other motor skill?

An important implication of the role of the kinesthetic sense is that a manipulative skill cannot be acquired by merely looking or by listening to an explanation of it. The learner must engage in the manipulative act, must engage in the doing, must practice. He must get the feel of the thing firsthand if he is to develop a motor skill. No doing or practice, no manipulative skill.

Motor learning is not confined to the muscles or segments primarily involved. The whole body does the learning, and the learning "resides" in the complete organism, not just in the limb or other part with which the acts are usually executed. Losing the limb or part does not take away all the learning. For example: I write and saw boards with my right hand. Remove my right arm and I can still write and saw boards, albeit rather crudely. The ability remains with me.

The Role of Visual Observation. Preceding statements do not imply that the sense of sight has nothing to do with acquiring a manipulative ability. Visual observation by the learner is often helpful, sometimes almost indispensable, to the acquiring of a particular skill. In skills in which the hands are used,

the hand may be watched as it performs. Visual observation promotes motor learning in still other ways. It may play an important role in the learner's getting a concept of what a finished product is like. The finished product is often very helpful in establishing the mental goal or ideal toward which the learner is drawn as he practices. The establishment of an ideal is important. In nearly all motor learning, it is wise to direct attention upon the result to be attained, the product-goal. Also, in many instances the process of performance can and should be demonstrated to the learner so that he may see it. Showing one is usually easier than telling him. For example, it is much easier to show one how to hold a hammer than to tell him. There is often more likelihood of being understood correctly when one is shown than when he is told. Thus demonstration frequently has an important place prior to manipulative performance by the learner, and often at various stages in the development of the skill. Giving a demontration is further discussed later in this chapter under General Procedure for Teaching a Manipulative Ability.

Observation by itself never produces the manipulative skill. Sometimes it contributes little or nothing to acquiring the skill. For example, the beginner in pig castration would perhaps profit little by watching an expert perform in his usual rapid fashion. He is not capable of *observing* such performance, he only looks on.

Necessity of Goal or Objective. Perhaps the first principle in securing manipulative learning is to make sure that the learner has the desirable goal clearly in mind. Then as he practices he will progressively approximate his goal. The learner must know in general what is to be done and how to do it, especially *what* is to be done, and he must attempt to do it. He must attempt to perform in such a manner that the result will be as good as the standard of performance he has accepted. Naturally, this knowledge of performance cannot

extend to such aspects and particulars as the learner will be able to appreciate later on only. But goal activity there must be, for it is only with reference to some goal that integration of an act of skill can take place. One cannot acquire a skill by passively going through, or being put through, the motions of the physical act. Whatever the resulting action, it is not a skill. One of the biggest tasks in teaching skills is to get the students to appreciate and accept good-performance or good-workmanship goals. Too often the expression is heard, even from instructors, in commenting on work done, "That is pretty good for a boy," when good workmanship for adults would be the appropriate goal.

Learning the Act as a Whole. It is erroneous to believe that a manipulative skill should be analyzed into its elements or parts, and that each of the parts should be practiced and learned singly. The reasoning back of this belief is that to master the whole, one must master the parts; that if one learns to do singly all the parts, putting them together will be easy. But the whole skill is not the sum of the disconnected parts. One may be able to perform the parts separately and yet be utterly unable to execute the performance as a whole. The skilled performance has not yet been perfected by him; the complete *pattern* is lacking; the integration has not been made; the sequences, the mergings of the steps into each other, have not been learned; the *whole* has not been practiced.

If in practicing the whole, it is revealed that some part is difficult to learn, this part may be singled out for special practice, but not before that time. Then the part takes on a nature, significance, and character which it would not otherwise have had; it now belongs with the whole and is not a part by itself. The part should finally again be practiced where it belongs in the whole.

The good teacher attempts to bring about the desired behavior in as nearly as possible the same situation which should

secure that behavior in the future. In the future the whole performance provides much of the setting or situation which may be expected to elicit appropriate behavior with respect to its parts. Each part will tend to call for or elicit the succeeding or accompanying parts.

Knowledge of Success and Error. If the learner is making errors but is not aware of them, there will be no decrease in his errors. Errors may be learned through practice as truly as anything else may be learned through practice. Thus the teacher must be on the watch for errors being practiced, he must know good performance. Errors cannot well be avoided in manipulative learning; but they can be eliminated, provided that the learner becomes aware of them, desires to eliminate them, is shown the better way, and is capable of learning the correct procedure. It is not meant to imply that the emphasis should be placed on what *not* to do. Stress the positive rather than the negative as a rule. Establish a standard of perfection, demonstrate good procedure, help the learners know wherein they are succeeding. When the learner realizes that he is doing a thing the correct way, the kinesthetic and visual senses have something to go by; and there is satisfyingness which promotes learning by making for vividness of experience and by encouraging repetition of the correct movements.

Accuracy versus Speed. Generally the objective of a new manipulative skill should be accuracy first, then speed. It is easier to develop both speed and accuracy by first stressing carefulness than by trying to correct errors after an attitude of careless speedy work has been acquired. However, speed, where desired, should be made a conscious objective for the learner as early as possible without sacrifice of accuracy. Slow action and quick action are not the same.

Two main variables are used in experimental work for measuring progress in acquiring manipulative skills: the time taken to do a unit of work, and the quality of the work done.

A decrease in the amount of time necessary to do a piece of work, without decreasing the quality of the work, is evidence of acquiring skill. Likewise, an improvement in the quality of the work, without increasing the time, is evidence of acquiring skill. Success in vocation usually calls for both speed and quality.

The Learning Curve. Where manipulative skills already possessed contribute materially to the skill being acquired, rapid initial progress is usually made. Otherwise, progress may be slow. There is often one or more periods of apparently no progress, in which the learning curve flattens out. This "plateau" may be due to any one of several causes. It may be, of course, that improvement is being made but is not observable. Real lack of progress may be due to a low standard of attainment, there being no "pull" toward a higher standard. It may be due to unnecessary movements that stand in the way of improvement, regardless of effort by the student. It may be due to his not knowing how to proceed or to lack of frequency or intensity of practice. It may be due to conflicting methods of practice, practicing one way one time and another way next time. The learning curve always tends to flatten out toward the upper end as one reaches perfection or approaches his limit of performance. The amount of practice required to obtain a certain amount of improvement as one nears perfection is much more than is required for the same amount of gain at the beginning. In most skills approaching perfection, improvement is obtained only at the cost of a great deal of time and effort, more than most students have the inclination to expend in view of all the other things they want to do. A high degree of excellence in any skill or art, however, demands this added effort.

Intelligence. Intelligence plays an important part in the development of complex manipulative skills. A function of intelligence is to control and coordinate muscular activities.

Simple skills require only a small amount of mental direction and therefore have little relation to intelligence; the relationships to be seen are few and easy to see. Complex manipulative skills, however, where relationships are difficult to see, require much intellectual control and training. They are an index of intelligence.

Mechanical intelligence (to deal with objects) and abstract intelligence (to deal with ideas) do not necessarily exist together. Teachers must not assume that general intelligence is a good criterion of the progress a student will make in developing a motor skill. Often, even if they possess much mechanical capacity, the brighter students take less kindly to the drill necessary to acquiring a motor skill. This weakens motivation and interferes with the efficiency of practice. The duller students often seem to enjoy drill work. Temperament and other personality traits and conflict of interests may also tend to obscure the relation of intelligence and skill.

General Procedure for Teaching a Manipulative Ability

1. Have clearly in mind the *ability* or *abilities that are to be taught*, including the standard of workmanship the students should come to have. Creditable workmanship, of course, should refer to the meeting of a standard appropriate to the particular work to be done. Recall our reference to handsawing ability, page 142.

2. Develop in the students a strong desire to possess the *manipulative ability*. In doing so, it may be desirable or even necessary to have the students see a product that has been produced by a skilled person, or in some cases, see the skilled performance. This not only serves the purpose of motivation, but is useful in developing an ideal in the mind of the student. It goes without saying that the students must know why the skill or ability is needed if they are to desire to possess it.

They must feel the need for that ability. Merely to tell them that "a farmer ought to know how to do this" should not be expected to furnish a vigorous motive.

3. If the students now desire to possess the ability and want to acquire it, acquiring it is their *problem*. The problem may or may not be stated. The situation has set the problem (as it often does, and without statement).

4. Ask the students to name the important steps in doing what they are now about ready to learn to do. These they can usually name unless the process is wholly unfamiliar to them. If necessary, guide the students in naming or listing the necessary steps. These steps constitute a kind of an analysis for solving the problem, whether or not they are called an analysis.

5. It may or may not be necessary or desirable at this point to have the students read on how the different steps should be performed. This depends largely on the particular manipulative ability and the group of students. In many abilities, a demonstration here is better than the reading. Sometimes the students should read later, in order to round out their understanding and make clearer to them certain parts or points in the procedure.

6. Demonstrate the procedure if it is difficult for the students to grasp or understand. The demonstration can be given by the teacher, by any other skilled person, or in some cases by means of films or slides. Show and explain how to perform each operation, step by step. Often some of the "why do it this way" will need to be brought in. Proceed slowly. Direct attention to what needs to be observed; give time and opportunity for uninterrupted observation. Take care lest the too-continuous explanation interfere with the observation. Remember the magician at the show whose continuous talking directs attention from what his hands are doing. Encourage questions from the students, to clear up things not well under-

stood. Sometimes references may be cited, which the students may read before, after, or as they perform the operations. Obviously, if the demonstration is to be most effective, all the students must be able to see and hear what is being shown and said.

7. Have the students perform the process, each student "trying his hand" at performing the fundamental operations. There must be enough tools and materials for the students to use. Give the necessary supervision to the students—revealing and correcting their errors and commending successes, demonstrating individually where necessary. If it is discovered that an error or lack of understanding is common to many students, redemonstrate this step or aspect or make the explanation again to the whole group. This saves teacher time and student time, giving help most quickly to the greatest number of students.

8. Have practice exercises that involve the operations being taught. Usually the students will need to develop some degree of skill before using the operation on a very large scale or on a valuable piece of work. To develop this degree of skill, a practice exercise may be used that involves the operations, techniques, and standards of workmanship. Check with the individual students doing the practice exercise, to emphasize proper techniques, standards, and understanding, and to correct errors or weaknesses.

9. Provide practice in judging the finished products of their efforts (or performance, in some cases), alternating with performance as a rule, until the students learn to distinguish the good from the not so good product. The products of the students will never be better than their judgment of the products. Until one can distinguish between the good and the poor product, he will not be able to produce the good one. The finished product should always be judged in terms of the pur-

pose it is to serve. For example, a hog trough is not a piece of furniture for the living room.

10. See that the students use the correct practices in all their subsequent work. The change in behavior must be complete and permanent.

This general procedure can be modified to suit the particular kind of manipulative ability being taught, the nature and size of the group of students, and the adequacy of materials and tools available. Many manipulative abilities can be acquired to better advantage by small groups. The teacher may have the very practical problem of "staggering" the teaching of certain manipulative abilities so that a small group may be taught a skill while the rest of the class is busy at something else. In some cases small groups can be taught on the farms or elsewhere when school is not in session.

CHAPTER 7

DEVELOPING ATTITUDES

Feeling is the essential feature of an attitude. Attitudes are weighted to a greater or lesser degree with emotional content. How one looks on a thing, his interest in it, how he appreciates it, what it means to him, his belief about it, how it appeals to him, how he is inclined to behave toward it is his attitude concerning it. The attitude may be mild or indifferent or very strong. Attitudes are perhaps the most important of the three forms of human behavior—feeling, doing, knowing—from the standpoint of adjustment, happiness, and success. In spite of this fact, traditionally schools have tended to stress attitudes the least. Dr. Paul J. Kruse, in an article in *The Agricultural Education Magazine* a few years ago, wrote as follows: "The importance of feelings as determiners of conduct seems far too little recognized in practice. Man calls himself the reasoning animal. We may grant that of all animals he most merits this description, but we are much mistaken if we assume that reason largely determines his behavior."

Nearly all attitudes are learned. They should be objectives of teaching. If the teacher does not list attitudes as separate objectives of teaching, he must at least be concerned with the attitudes that go with the other learnings he seeks (see pages 54, 58). The effectiveness or functioning of many of the abilities acquired—manipulative abilities and others—depends almost wholly on how the learner feels in situations that may call for their use. For example, the ability to feed dairy cows according to production will be nonfunctioning unless the learner's attitude is such as will get the cows fed according

to production. If the learner is indifferent about it, thinks it too much trouble, does not believe that it pays, is not concerned with the results, then his ability to feed dairy cows according to production is not effective regardless of what else he may have learned about the feeding. All around us we see illustrations of the fact that the difference between ability to do and *effective* ability to do may be the difference in attitude. We see the man who does not repair a leak in his poultry house but who possesses the necessary skills to repair it. We see the boy or young man not feeding a protein supplement to his pigs when he very well knows how to feed the supplement.

Attitudes are not only important in their own right as a learning product and important in influencing the use made of other learnings, but they are important in influencing the learning process. They are a great determiner of what shall be learned. Generally speaking, it is futile to try to develop abilities in students in the absence of desirable attitudes. We have previously discussed motivation as a factor influencing learning, have seen the importance of an active rather than a passive attitude on the part of the learner, and of a goal to the learner, and have commented on intensity of experience as a factor influencing learning. How the student's interest may affect his learning is common knowledge. In many instances the student's interest has more influence on his learning than does his intelligence. There is hardly any limit to the influence of attitudes on the process of learning. They are always part of the learning situation, affecting what shall be reacted to and the quality or intensity of the experience. Attitudes affect sensitivity. What a student sees or hears at any particular time depends in no small measure on his attitude. Attitudes also affect interpretation of what is sensed. For example, the student believing that it pays to fertilize cotton and having some cotton to fertilize finds in the readings and class discussion on

fertilizers meanings quite different from students who believe that fertilizing "is all bunk."

An attitude may be very comprehensive. It may cut across or extend to many abilities and mental activities. For example, an attitude that it does not pay to fertilize cotton may affect all the abilities and mental activities in fertilizing cotton—what fertilizers to use, how and when to apply them, etc. An attitude that experimental results are "just made up" may cut across almost the whole field of agriculture. The possible comprehensiveness of an attitude may indicate to a teacher its importance.

How Attitudes Are Learned. Attitudes are acquired or modified through learning in accordance with the principles of learning discussed in Chap. 2. The same general principles apply to all learning. Learning is an active process; one learns only through his own activities. In all learning, the reactions that are learned are the reactions that are practiced. This principle holds as true in the learning of attitudes as in the learning of anything else. What attitudes the learners practice—what attitudes they express, in language or some other way—is tremendously important in determining what attitudes they are to possess. Attitudes are developed only through the behavior of the learner; they are learned only through practicing an attitude, a feeling. Intensity or vividness is a factor in practice; it is a part of the practice. And learning manifests itself only in changed behavior.

What proves to be satisfying and what proves to be annoying to the learners must not be overlooked by the teacher in developing attitudes. If an object, occasion, or idea is satisfying to the student, the satisfyingness tends to become attached to the object, occasion, or idea so that the student reacts favorably to it—has a favorable attitude toward it. On the other hand, if an object, occasion, or idea is annoying to the student, the annoyingness tends to become attached to

the object, occasion, or idea so that he reacts unfavorably to it —has an unfavorable attitude toward it.

Learning is never single. Varied learnings, not just one learning, are always going on. When a student is solving a problem in the classroom, he is also acquiring an attitude toward the subject being dealt with in the problem, perhaps also toward the teacher, toward schoolwork, toward agriculture in school.

People acquire most of their attitudes without intending to do so. However, attitudes may be learned intentionally. One may acquire an attitude simply by intending to acquire it and then proceeding in an intelligent manner. Attitudes can be taught intentionally (which is the only way anything can be taught). They can be taught by the teacher's knowing what attitudes he desires the learners to acquire and then going about teaching these attitudes in keeping with the principles of learning.

Relation of Attitudes to Understanding, Interests, Ideals, and Appreciations. The teacher should be better able to develop attitudes in the learners if he knows how attitudes are related to the things named in this heading. We shall attempt to point out some of these relations significant to the teaching of agriculture.

Understanding. When a person comes to understand or is informed on something, his attitude toward it may become quite different from what it was. A few illustrations and a little reflection on the part of the reader should make this fact clear. A person sometimes comes to condemn severely an act in others which did not receive unfavorable responses before *he* learned that it is "not the thing to do." We have seen such instances. A person who knows little about a thing may have strong prejudices with respect to it which he would not have if better informed. It does not necessarily follow, however, that the more one knows about a thing, the better his attitude

will be. Other factors operate, such as self-interest, extent to which an unfavorable attitude previously existed, habits of open-mindedness, etc. It is not unusual for a person to reject information that is unfavorable to his bias and to seek and accumulate information that confirms it.

Many farmers change their attitude toward a farm job or practice when they find out how well the practice pays. Thousands of men now milk cows and like it who considered milking disagreeable work before they found that dairying is profitable.

A student's attitude toward a practice is often changed after he finds out why the practice gets good results. For example, when he understands the uses of protein in the body of a growing animal, he may come to have a different attitude toward feeding a protein supplement to pigs. One's attitude toward a fact of nature or science may be changed when he understands the fact. When a student learns (even in a general way), for example, the function of chlorophyll in plants, he may feel quite differently about the greenness in plants and how plants grow—perhaps about plants in general. Coming to see, where one was once blind, is often cause for a change in attitude.

Teaching the understandings that bear on the attitudes desired is one of the chief things a teacher can do in building attitudes in students. The teacher, however, must be clear on this fact: An attitude is developed or changed only through practice of the new attitude or feeling. Information or understanding does not necessarily result in such practice.

Interests. Interests play an important part in determining the activities in which people engage and their feelings while engaged in these activities. Interest is a compelling force in shaping the lives of people. We need only to witness its triumphs in art and invention and its achievements in the pro-

fessions, in farming, in homemaking, in school studies, indeed in every kind of work activity.

The dictionary defines interest as "concern." An interested person is concerned, he cares about. He is concerned with what will affect him, and he desires to act, if possible, so as to secure or avoid the foreseen result. (He is concerned with what will affect others to the extent that he identifies himself with others.) Herein lies a cue for the teacher: Develop in the students, or recognize in them, worthy foreseen desired ends so that their activities may easily be directed toward those ends. The interested person is actively identified with something; he has an emotional inclination, a feeling, an attitude. Interests are the "inner springs" of thought and action; they are a natural justification for effort.

The teacher should distinguish and build up worth-while interests in his students. The teacher or school is very shortsighted if it merely feeds the present interests of students. Interests are a measure of the quality of selfhood. Improvement of quality of self is not only possible, but it is an exceedingly important part of education. New interests can be developed, they can be taught, they can be "created by design." Under skillful teaching, students can even learn to like what they now dislike.

Important to the teacher in securing and maintaining interest is the relation of success and interest. Initial success in an undertaking by the student is conducive to his interest in it and should be secured whenever possible. As the student succeeds in what he is doing, as his understanding or ability increases, his interest usually increases. People are nearly always interested in what they can do well.

Ideals. An ideal is *something toward which to strive.* In this statement is implied the part that ideals play in influencing activity and their importance as a learning product. The ideal is a sort of a "hunger" toward the filling of which the activity

is directed. Thus it has the essential characteristic of an attitude: feeling. The ideal toward which to strive becomes also a standard against which results in attainment are measured. Progress toward attainment tends to bring satisfyingness; and failure, annoyingness.

An ideal, strictly speaking, is not attainable, as it represents the perfect. It always moves on ahead of him who approaches it. In one who pursues the ideal there remains the urge to further achievement. While achievement may bring satisfaction, the hunger is not appeased. One is never able to produce the perfect animal, build the perfect barn, do the perfect sawing job, make the perfect speech, or teach the perfect lesson.

Ideals are closely related to desirable goals which are attainable. Such goals are usually set only after the ideal has been established. Obviously, such a goal is short of the ideal. Even so, the learner's goal may call for considerable effort to attain and may represent a practical degree of attainment.

Ideals are great motivators of effort. They usually precede the development of abilities. Students strive willingly to secure the understandings and develop the abilities which the ideals demand. Ideals of attainment by the student are necessary in order that he may be drawn toward them as he practices, and they are necessary in evaluating attainment.

While we may not always know how to teach them, ideals are learned and can be taught. We do know some things about teaching them: they have their origin in interest. Students do not acquire them while in a state of indifference or unconcern. Also, if students are to have "something toward which to strive," a satisfying degree of attainment must seem possible to them. It must seem possible to them to attain the result by putting forth the effort they are willing to put forth. An ideal is not taught unless it becomes the student's ideal. The

student must come to have the "hunger" to achieve the ideal, and should make a definite decision to strive to do so.

Dr. W. H. Lancelot in his *Permanent Learning*[1] has an excellent chapter on Leading Pupils to Adopt Ideals.

Appreciations. The dictionary defines the verb appreciate as "put a right or just estimate or value on." This is the concept we propose to stress. Appreciation is not confined to such things as literature and pictures and music. An appreciation of a thing is a kind of feeling toward it. Certain feelings toward things can come to people only by their having direct experiences with those things. Often teachers err in assuming such experience on the part of the students. For example, they assume that students have a feeling or appreciation for keeping accurate records when the students have had no firsthand experience to justify such an assumption. Or they assume that the students appreciate a table of experimental results when the students have had no concrete experience that would develop such an appreciation.

Appreciations are learned, as are other attitudes, by experiencing the feeling involved; they cannot be imparted or given to students secondhand. The feeling experienced by the student fixes his attitude, regardless of what he is told or what he reads. It is possible, of course, that a student's feelings may be influenced by what he observes in the feelings of others, but his feelings are not influenced by mere symbols (words and the like) that represent the feelings of others. One can feel "with" another. However, his feeling with another is prompted by his having had an experience similar to that of the other person. For example, one can feel with a boy whose sheep have been killed or with a young man striving to get ahead, if he himself has experienced such things.

It has been suggested that appreciation, like interest, in-

[1] W. H. Lancelot, *Permanent Learning*, John Wiley & Sons, Inc.

volves a kind of self-identification. Thus one feels himself a part of the thing appreciated; his strivings, hopes, and loves are there expressed.

What the Teacher Can Do. Several suggestions on what the teacher may do in developing attitudes have been made or implied in this chapter. If the teacher is to be most successful in developing desirable attitudes, he must believe that attitudes are important to develop and he must make them objectives of his teaching. Attitudes *can be taught.* In *The Psychology of Wants, Interests, and Attitudes* Thorndike says, on the basis of considerable research, "The results of our experiments support the conclusion that a person can be taught new attitudes and tastes as surely, though not as easily, as he can be taught facts and skills."

If the teacher has attitudes as a teaching objective and if he realizes that an attitude is learned only through practice of the new attitude, the new feeling, he will have much to guide him. Attitudes are learned in accordance with the same general principles that other things are learned. The student has acquired a new attitude only when he comes to feel differently toward a thing than he felt before.

Modern psychology has contributed the basis for the understanding of learning that takes fuller account of feeling than did earlier psychology. That the principles of learning stated in Chap. 2 include feelings may be seen from the following illustrations:

1. Experiences that occur together tend to recur together. This statement of the principle of association includes feelings. The older statement was in terms of association of ideas, when schools stressed the inculcating of knowledge. A feeling that occurs with any experience will tend to recur with that experience as, for example, a feeling of dislike occurring with record keeping. This the teacher should know.

2. Learning is an active process. This principle applies to

the learning of attitudes just as it does to any other learning. All learning takes place during and through the activity of the learner. If the teacher seeks to develop an attitude, he must set or select situations so as to get behavior that will result in the changed attitude.

3. The reactions that are learned are the reactions that are practiced. This principle applies in feeling reactions as it does in other kinds of reactions.

Perhaps the teaching of agriculture has emphasized *doing* or skills most largely, with considerable stress on the *knowing*. Without much question, there is need for more emphasis on the developing of attitudes.

CHAPTER 8

SUPERVISING PRACTICE

Practice is essential to learning. Not until agriculture teachers come to believe in the necessity for practice by the learners can they make their teaching vital. Participation in the agriculture one would learn is necessary to his learning it. Participation in farming is an essential in learning to farm. While practice or participation is a necessary condition to learning, it is not sufficient. Let us consider more in detail the role of practice in learning and the need for supervising the practice. (By practice is meant performance or some number of performances, as distinguished from theory.)

The Role of Practice in Learning. Learning may be defined as a change in behavior that takes place in the course of practice. The change in behavior takes place while performing the activity. Thus the teacher does not have supervised practice in order that the students may put into practice what has been learned, but primarily in order that the students may learn. Practice in some amount is necessary to the learning; it is necessary to acquiring and fixing modes of behavior, whatever the desired modes may be. The higher the student's level of aspiration the more he practices. He practices or performs in order to be able to perform at all; then he continues to practice so as to ensure retention, make himself more confident, or further perfect his quality of performance.

One learns by practice what he practices. This is not a silly statement; it is an important truth. To practice an error is to tend to learn the error. To use a poor practice in farming is to tend to learn the poor practice. To dislike record keeping as

one keeps his records is to tend to learn a dislike for record keeping. Improvement in a function may be expected only when one performs the function better. The wrong practice tends to get the wrong learning. Spiritless, aimless activity is not effective in securing desirable learning. Motivated practice of the correct procedure, on the other hand, with the student desiring to improve his performance, may be expected to bring improvement.

Practice or use is not only essential to the initial learning, but subsequent use is usually necessary for retention. Abilities once developed need to be kept alive if they are not to be lost, no matter how thorough the initial learning. The principle of practice in learning is discussed on pages 13 to 17.

Areas in Which Practice Is Needed. If a teacher lists the learning outcomes he is to strive for, he will have a list of the areas in which he will need to secure practice. Practice by the student is necessary if the student is to learn. Therefore, the teacher of agriculture should have participation or practice in all the areas in which he hopes to secure learning. The areas, of course, would not be limited to what is often termed improved or approved farm practices. These may be included, to be sure, but they themselves do not reveal all the areas in which the student of agriculture should get experience. We cannot very well make a complete list of the areas in which experience or practice is likely to be needed. These statements carry their own implications: If the student is to learn to think in agriculture, he must think in agriculture. If he is to learn to plan a farming program or a farming activity, he must do such planning. If he is to learn to keep farm records, he must keep records. If he is to learn to evaluate the results from farming or an enterprise in farming, he must evaluate results. If he is to learn independence, he must experience some aspects of independence. If he is to learn to cooperate with others, he must cooperate with others. If he is to learn to earn

money and save money, he must earn money and save money. If he is to learn to read authoritative opinion and recommendations, interpret experimental results published by his agricultural experiment station, and make use of them in farming, he must have experience in doing so. If he is to learn the managerial aspects of farming—those aspects on which success in farming largely depends—he must have practice in management. If he is to acquire a particular manipulative ability or any other kind of ability through learning, he must engage in the activities that will make the learning possible. Likewise, if he is to learn a particular attitude, he must have that kind of feeling while learning it.

The areas in which practice should be secured will depend largely on the kind of agriculture taught and the particular group of students; in short, on the learnings to be secured—the teaching objectives. For example, the areas in which the teacher of prevocational agriculture will desire to secure practice by his students will be different from those of high-school teachers of vocational agriculture. The teacher of a particular adult-farmer group will have a still different list of areas, as will the teacher of general agriculture in the high school or the teacher of a college class.

The Need for Supervising the Practice. Not just any doing or participation or experience will produce desirable learning. The doing or participation may be miseducative; it may be of the wrong kind. Through it further learning may be arrested or distorted, in a number of ways. One may learn errors, poor performance, or wrong procedures. Callousness may be engendered, or lack of sensitivity and responsiveness produced. What one learns may land him in a groove or rut. It may promote the formation of a slack and careless attitude. His experiences may be so disconnected that they are not linked to one another in such a way as to produce desirable learning. What one learns may narrow or restrict his opportunity to

learn through future experience. Thus we have the desirability or necessity for supervising the performance or practice of the learners by the teacher. It is the teacher's opportunity to direct the activities of the learners so as to produce the largest amount of the most desirable intended learnings and the smallest amount of undesirable learnings. Through supervision he should be able to increase the quality of the performance and get a greater amount of experience where it is needed.

Practice needs to be supervised for still another reason. Unless practice is conducted in the general situation in which good performance is desired, it will not be most effective. In most teaching of agriculture, the home farm provides the cues for behavior when away from school. If there is to be much carry-over from school to home farm, it will usually be necessary for the teacher to do some teaching at the farm —to give some supervision to the practices he would have the student perform correctly and learn.

Good teaching of agriculture, however, is not wholly a matter of supervising the practice of the students on the farm. It seems that mankind likes to think in terms of extreme opposites. He believes either this or he swings to the opposite extreme. Traditionally schools have tended to stress classroom instruction, with a great deal of reading as almost the sole method of becoming educated. We must not jump to the other extreme and believe that the only way to teach agriculture is to supervise the activities of the students on the farms and in other places outside the classroom—that there is no need for instruction as such. There is a place for classroom instruction and for supervised practice outside the classroom. It is not an either-or proposition. A combination of the two is the pattern generally accepted in vocational education in agriculture. Neither instruction without practice nor practice without instruction is vocational education. Instruction in the school should precede (but not be too far ahead), accompany,

or follow the practice on the farm or in some other natural setting. The two should not be divorced.

The Role of Supervision in Teaching an Improved Farm Practice. The role of supervision in teaching a better farming practice may be seen in the analysis that follows. Likewise, the relation of class instruction to the teaching of these practices may be seen in the analysis. Much of the work of the teacher of vocational agriculture is teaching improved farming practices. If students do not adopt and continue to use the improved practices taught, there is a weakness in the instructional program.

In order to teach an improved farming practice, the teacher must develop in the student (or students):

1. A belief that the practice or procedure is a good one. The student must be convinced that the practice is a desirable one for him to use, he must be "sold on it" if we expect him to carry it out. The belief may be largely or wholly developed in the classroom. However, on supervisory visits the teacher should help the student see the benefits he might get or is getting from using the practice; the student must continue to believe that the practice is a good one for him to use. Result demonstrations are often effective in convincing students of the desirability of a practice.

2. An understanding of how the practice should be carried out. This constitutes the standard of performance. One is not likely to use a practice unless he thinks he knows how to use it. Many of the more complex practices and those requiring considerable skill will usually require close supervision before most of the students will understand how to carry them out.

3. An understanding of the basic science or theory underlying the practice. Such an understanding often contributes greatly to one's believing the practice is a good one, as well as to his being able to carry it out or evaluate the results under

varying conditions. An idea or practice usually seems more plausible to one if he understands it. People accept and believe much more readily those things which seem plausible to them. Also, people get a great deal of satisfaction out of understanding what they do. Agriculture is *scientific* agriculture largely to the extent that the practices are based on scientific principles. Securing understanding is discussed on pages 44 to 46.

4. The ability to see that he can use the practice in his own situation. If one does not see that he can use the practice or adapt it to his own situation he rejects it, and there the learning ends. One learns only what he accepts to act on. Good instruction and the proper kind of supervision may enable the student to see that he can use the practice in his situation.

5. The ability to plan to carry out the practice in his own farming program. At first the planning may be done under supervision, the amount of supervision and help needed varying with the students and the difficulties they meet. The ability to *plan* is more elementary than the ability to *do*. It comes first; if one cannot plan a practice, he is not ready to carry it out. Good planning is important. Many students learn not to attempt to use a practice again because they fail to carry it out properly the first time they try it. Planning helps ensure a moderate amount of success in the first undertaking, which is very helpful to continued acceptance of the ideas and to learning.

6. The ability to carry out the practice, at first under the supervision of the teacher if necessary. The student must have confidence in his ability to carry out the practice if we expect him to carry it out. Supervision may be necessary to this confidence, or to the ability to carry out for that matter. Supervision also helps the learner discover errors to avoid in the future and gives him confirmation of what he is doing that is right. It helps ensure success in the undertaking.

7. The ability to use the practice in his own farming program, under his own direction. This is the end toward which the teacher strives. The only real proof that a student has learned a practice is his use of the practice when "on his own." Good systematic instruction in teaching improved farming practices must provide opportunity for the students to use the practices under their own direction.

8. The ability to evaluate the results from the use of the practice. The student needs to know what the results were and, if possible, why. He thus becomes still more able to go his way alone intelligently. At first the evaluation may be teacher-guided, sometimes as class or group experience.

The Tendency to React to Old Situations. The agriculture teacher who would succeed in getting good farming practices carried out must know that the learner tends to react to the old situation, to the familiar, as he has reacted to it before. Boys, men, and young men leave the classrooms and go home to the familiar. The old situations are as they left them: the animals, the crops, the feed, the tools and machinery, the filthy or clean fields with their fertility or lack of it, the barn and outbuildings, the home and other members of the family which may include the "monarch" and all his behavior. In the old situation one tends to do as he has done before. This is true in all of his practices, including the poor ones. The problem of the teacher is to get the desirable practice followed in spite of this tendency in human behavior. In order for the teacher to succeed, the learner must go home —back to the familiar—firmly convinced of the desirability of the good procedure or practice, very clear on how to carry it out, and with at least a fair understanding of it. Otherwise, the learner is almost sure to react to the old situation as he has reacted to it before.

Herein lies our hope: the learner himself is a part of the situation. If, when at home, he remains convinced of the de-

sirability of the good practice or way of doing, understands it, knows how to carry it out, and has supervision by his teacher—the same teacher with whom he associates the desirable practice and in whom he has confidence and whose approval is satisfying to him—these are new elements in the old situation. All such new elements in the situation are important if we expect new desirable practices to be followed at home.

There is still other significance to the fact that one tends to react to the old situation as he has reacted to it before. Perhaps the teacher is first aware of it in his use of problems in the classroom, as was pointed out in discussing problem solving in teaching. The poor, common practices in the community and the undesirable in general tend to become the accepted and approved practices. Familiarity breeds not contempt, but content. The accepted and familiar does not tend to present difficulties. Weaknesses in practices do not in themselves constitute difficulties, therefore they do not in themselves set problems.

Relation of Supervised Practice to the Course of Study. Since practice is necessary to learning, there should be a close relation between the farming programs of students in vocational agriculture and the course of study. It is easily possible for courses of study in agriculture to contain too much that has no bearing on what the students do outside the classroom. Often the students may have no opportunity to do the things included in the course. Or so much may be crammed into the course that nothing is taught well enough to function in practice on the farm. The doing may not really be expected or sought by the teacher. The students may neither be convinced that the things should be done nor learn how to do them. They may not accept the things to act on. Where such things are true, the students tend to continue to react to the old situations as they have reacted to them before. Vocational agriculture advances only as the people engaged in it recognize the

necessity for practice, relate the practice to the course of study, and are able and willing to supervise the practice.

Supervised Farming Programs in Vocational Agriculture

The primary aim of vocational agriculture under the organic vocational education act (Smith-Hughes Act of 1917) is *to train present and prospective farmers for proficiency in farming*. The aim cannot be accomplished without supervised farming. This vital element in the program was written into the Federal act in these words: "Schools shall provide for directed or supervised practice in agriculture, either on a farm provided by the school or other farm, for at least six months per year." The "home-project program" of teaching agriculture had been developed in Massachusetts as early as 1908. Supervised farming today has a much broader meaning than when the Smith-Hughes Act was passed. Instead of having a project or projects, boys and young men now have farming programs, with no thought of a minimum of six months. Also, supervised farming has come to be an integral part of vocational education in agriculture.

What a Good Supervised Farming Program Consists Of. The supervised farming program of a department of vocational agriculture should include (1) productive-enterprise projects, (2) improvement projects, (3) supplementary farm practices, and (4) placement for farm experience. It may include group projects or class projects. Farming programs of most boys and young men should consist of the first three. In most communities only a few students are placed for farm experience. The word "project" is not ordinarily used in referring to a part of an adult's farming program.

1. *Productive-enterprise Projects.* These are sometimes called "productive projects" or "ownership projects." A productive-enterprise project is always an enterprise—a crop or

some kind of livestock—and the student always has a degree of ownership in it. He may own all of the project, he may be a partner with his father or brother or someone else, or he may receive a part of the returns in some other manner. But he shares definitely in the returns and in the losses, and the project is wholly or at least partly under his control. It is desirable that the student have complete control of it. Of course, he should expect to make a profit.

The enterprise is carried through a complete production cycle. For example, a corn project begins with securing the seed and land for the crop, and ends with disposing of the corn produced, which may be through a sale to an animal project. A hog project ordinarily extends from the time the sows are selected for breeding until their pigs are marketed. A project involving dairy cows or hens usually extends through a twelve-month year. Any enterprise may be continued through more than one cycle or year, becoming a *long-time project.* Each cycle or year is a project in the farming program for that year. Usually it is only in the productive-enterprise projects that a student earns money for himself.

2. *Improvement Projects.* There are many kinds of improvement projects. An improvement project may be in a crop or animal enterprise, such as corn, cotton, tobacco, poultry, or hogs; or it may be in almost anything else that needs improving on the farm, whether to increase the income or value of the farm or to make the farm a more enjoyable place to live. The student may do only part of the labor, or he may do all of it. No degree of ownership is necessary in an improvement project, but usually there should be some managerial responsibility. There is usually no expense to the student, and no financial return to him. However, pay received for bringing about the improvements does not keep the project from being an improvement project. The project is usually financed by the parents or landlord. Examples of improvement

projects are dairy-herd improvement, pasture improvement, soil conservation, home-grounds improvement, home-garden improvement, orchard improvement, improvement in egg production, keeping farm records, developing a well-equipped farm shop.

As in productive-enterprise projects, an improvement project is usually carried through a complete cycle; it does not consist of doing only a job or two. Thus an improvement project in poultry usually would be the same length as a productive-enterprise project in poultry. A lawn-improvement project would consist of more than fertilizing the lawn. It might consist of seeding, fertilizing, rolling, and clipping the lawn as well as setting out and pruning shrubbery and setting out and caring for shade trees.

The number of improved or approved practices to be carried out does not determine whether a project is a productive-enterprise project or an improvement project. Good practices should be used in all projects.

Improvement projects often make it possible for the student to have a larger farming program than he would have without them. They offer him the opportunity to gain valuable experience, to develop abilities needed in farming. They may also enlarge the farm income or contribute to the family welfare, or do both. Many teachers feel that almost every student should have at least one improvement project each year.

3. *Supplementary Farm Practices*. Supplementary farm practices are the practices which supplement what is done in the productive-enterprise projects and improvement projects. They provide learning experiences that would not otherwise be provided. They refer only to individual jobs, not to a crop or an animal enterprise as a whole or to the complete cycle in some other large undertaking. They consist of carrying out any improved or approved practices in agriculture which are not a part of the projects. For example, there may

be the jobs of treating poultry for lice, pruning apple trees or grape vines, castrating pigs, drenching sheep, making farm gates, getting rid of moles, installing a kitchen sink, treating seeds to prevent disease, setting out shade trees, inoculating alfalfa seed. The purposes of supplementary practices are the development of ability in doing certain jobs and to bring about improvement of practices on the home farm. A boy or young man may introduce many new practices in a year.

Supplementary farm practices are not the chore work one does at home in the same way he would do it if he were not taking agriculture. They should always represent the better way of doing things. Many of them will grow out of the work the student does at school. Also, at school one may often be working on how to improve certain practices at home. The student will study, as group work or as an individual problem, what to do and how to do it before he carries out the supplementary practice. Supplementary farm practices may be done away from home in order to develop certain skills if conditions or situations are better there than on the home farm.

4. *Placement for Farm Experience.* Occasionally a boy or young man has such inadequate facilities for a farming program at home that he needs to be placed on a farm where he may have the experiences he needs. Placement may be for special farm experience or for general farm experience. A student who wants experience in dairying, for example, may get that experience by working on a dairy farm if proper arrangements can be made. The same thing would apply in commercial poultrying, tobacco production, cotton production, truck gardening, hog production, apple production, or general farming. The student may or may not receive pay for his work. Usually, if he renders a service he is paid for it.

In placing students for farm experience, the agriculture teacher has definite responsibilities. When a boy or young

man is to engage in this form of supervised farming, the employer, student, and teacher should have an understanding that the student will secure a variety of experiences useful to him and that the teacher will supervise these learning activities. A student should not be considered as placed for farm experience if he merely works on the farm for wages.

Illustrations of Students' Farming Programs. We are not yet ready to discuss selecting good farming programs for certain boys or young men. This will be taken up a little later. The illustration below shows only how a boy's farming program for one year may be made up of three parts:

1. Productive-enterprise projects
   - Hogs, 1 sow and 2 litters to be fed out
   - Corn, 5 acres
2. Improvement project
   - Pasture improvement, 10 acres
3. Supplementary farm practices
   - Culling hens
   - Setting out shrubbery in front of house
   - Building concrete steps at kitchen door
   - Shearing sheep
   - Removing calves' horns with chemicals
   - Treating tobacco bed with fermate

The illustration on the following page shows a farming program of a student, year by year, over a five-year period.

Group Projects. Many departments of vocational agriculture have group or class projects. These projects are carried on at school or near the school and are used to supplement the individual farming programs of the boys. They may or may not be enterprises. Young farmers seldom have group projects. The group or class project is a cooperative affair and may involve all the boys in a class or all the boys in the department.

FARMING PROGRAM OF A STUDENT FOR A FIVE-YEAR PERIOD *

Productive-enterprise projects	In high school				Out of school	
	1st year	2d year	3d year	4th year	1st year	2d year
Sows and litters	1 litter	2 litters	6 litters	10 litters	15 litters	
Registered beef	......	1 head	2 head	6 head	12 head	
Baby chicks	......	....	600 head	600 head	600 head	
Sheep	......	....	....	25 head	40 head	
Laying hens, ½ ownership	......	....	....	310 birds	300 birds	
Corn	3 acres	8 acres	8 acres	12 acres	20 acres	
Barley	......	....	20 acres	20 acres	20 acres	
Soybeans	......	....	....	20 acres		
Oats	......	....	....	....	12 acres	
Improvement projects	Developed agriculture library	Built fences Remodeled farm shop Planted 25 shade trees	Made blueprints and rearranged fields on 160 acres Remodeled farm buildings Painted barn Planted 20 shade trees	Contoured 40 acres Seeded pasture Built calf yard Wired barn for electricity Installed corral water line	Contoured 30 acres Planted an orchard Rebuilt a large hog barn Reconditioned farm machinery Rebuilt corrals	
Supplementary farm practices		Refitted small tools Built work bench	Tested milk	Rabbit-screened trees	Pruned apple trees	

* This program of a student in the corn-hog section is from *U.S. Vocational Bulletin 225*, with slight changes. It is to serve as an illustration only. Steady progression in scope and number of project enterprises may be noted.

In some instances it may be carried on by a special group of students interested in the undertaking and lacking opportunities for that kind of experience on the home farm.

Most group projects are carried out as an activity of the local Future Farmers of America or New Farmers of America chapter. Often they are a means of earning money for the chapter or department. Nearly always they should have educational value; they may have other values, such as justifiable publicity. Many teachers make good use of them as an aid in motivating instruction and for developing abilities that cannot be completely developed in the classroom. For example, in a tobacco group or class project, the boys can produce the plants, dealing with all the attendant problems and performing the necessary operations; they can cure, and strip and sort or grade the tobacco.

Certain group or class projects may contribute a great deal to the success of the individual farming programs. They may be the means of convincing students as to the desirability of particular improved practices. They may serve as result demonstrations. They may make available to students who would not otherwise have them such things or materials as plants, seed, or sires.

Aside from the cooperative aspect, group projects have at least one distinct advantage over projects often carried on by boys in their individual farming programs: they are wholly under the control of the boys and the teacher. Production goals can be set and the practices carried out to reach them. Observing, demonstrating, and participating can be done without having to secure approval of what is to be done.

A group or class project should be undertaken only when the boys are wholeheartedly interested in it. It must be very carefully planned.

Modern Concept of Supervised Farming. "Farming program," "supervised farming program" or some similar expression is

now generally used in referring to a student's supervised practice. Students no longer have just a project or even a project program. That used to be the concept. Experiences in as many as possible of the significant activities in the type of farming in which the individual is likely to engage should be included in his farming program. In order to get these experiences, it is usually necessary for boys in vocational agriculture to include in their farming programs productive-enterprise projects, improvement projects, and supplementary farm practices. The learning experiences are not limited to manipulative jobs or to "keeping records." They include these things, of course, but they also include careful study, planning, execution of the plans, summarizing the projects and the total farming program of the student, and evaluating the results. A farming program, as now conceived, is on going, ever growing. A student's program usually includes one or more long-time projects. Seldom, if ever, can a student get all the experience he needs in an important enterprise by carrying it through only one cycle of production, nor is it usually possible for him to "grow into farming" that way.

Students have farming programs, or ought to have them, because they are good to have—necessary to learning to farm and desirable for a number of other reasons. The most successful teachers carefully and effectively show the students the opportunities a farming program holds for them and the need for it.

An important development in the concept of supervised farming is the interrelation of instruction with farming programs. Their interrelation is discussed and the need stressed on page 170.

Other aspects of a present-day concept of supervised farming may be seen in the next division of this chapter, under Characteristics of a Good Farming Program.

Guiding Boys and Young Men in Deciding on Their Farming Programs

Teachers must assume responsibility for guiding students in selecting their farming programs if they are to direct the learning process. The learning activities are largely determined when the farming programs are selected. It goes without saying that teachers must have a sound concept of supervised farming before they can guide students as they should be guided in selecting programs and carrying them out. Certain aspects of such a concept have already been discussed. This section of the chapter enlarges on some of these aspects and introduces certain other ideas.

Why Have a Farming Program? Not only should the agriculture teacher understand the values and purposes of supervised farming, but also the students before they begin to choose their farming programs. Students should have farming programs because they are good things to have, not because of a requirement to have them. The teacher has a double responsibility here—to lead the students to see why they should have farming programs, and to know what a good farming program is. The two things cannot be entirely separated, though the first one will be discussed first.

Sooner or later the students will need to know what a farming program consists of. They cannot discuss "Why have a farming program?" or "Should we have farming programs?" unless they know this. Beginning students in vocational agriculture may not understand very clearly what a farming program is. The teacher will need to use local illustrations of students' farming programs, perhaps have the students observe some good programs on field trips, read descriptions of programs, and see some films or photographs of programs in operation, in order to develop the concept with the students.

After the students are clear on what a farming program is,

the teacher should discuss with them fully, freely, and frankly: "Why have a farming program as a part of our work in vocational agriculture?" (or some such wording of the problem). The students will be able to contribute a great deal to the discussion by their own thinking, under teacher guidance. It will be very helpful to the discussion if the students can do some reading on the subject.

Here are some of the reasons why students should have a farming program (from the standpoint of the student) which should come out during the discussion and be accepted.

1. *A farming program offers one an opportunity to earn money.* A good farming program should give the student this opportunity, through his productive-enterprise projects. Students want to make money and have money of their own. Most parents are willing to give their sons a chance to earn money. They know that it is better for the son to make money than to give it to him, and they know he should have the opportunity to save some money.

2. *Practice is necessary to learning agriculture.* The teacher knows the role of practice in learning and understands the necessity for supervising the practice. Now he must get the students to know and understand. Perhaps the students realize, or can easily be led to, that one must do what he wants to learn to do. They know that this is true in learning to ride a bicycle, to shoot basketball goals, to write, to be polite. Maybe it has not occurred to them, but they can be caused to see that one learns by improving his performance through his practice. If the students see that participation is necessary to learning agriculture and if they want to learn agriculture, practice becomes an opportunity for them and not a task. They will know that they cannot learn agriculture by just talking about it or watching somebody, that supervised practice is a necessary part of the course.

3. *The student receives the help and guidance of the teacher in carrying out his farming program.* It would be exceedingly helpful if the students could see the need for supervising the practice—could see that not just any doing or participation produces desirable learning. A good farming program, with the teacher's guidance and supervision, will give the student learning experiences he would not have without it and will increase manyfold the learning from the experiences he will have. If the student is to desire the help and guidance of the teacher, he must have confidence and respect for the teacher; he must believe that the teacher is his friend.

4. *A farming program helps the student achieve independence.* The student wants to become independent. Independence must be achieved. One achieves it gradually, not all at once. In primitive times the teen-age youth was not a dependent; he earned his living as a member of the tribe. Youth should not be kept wholly dependent too long. Every youth above 14 should have an opportunity to earn money and should be given some responsibility in planning his work and carrying out his plans. A farming program offers an excellent way for a student to achieve independence. It gives him a chance to earn money, to make decisions and carry them out, and to prove to his parents and "the world" that he is able and willing to assume some responsibility. If he measures up, still greater opportunities are usually opened to him, particularly by his parents. Proving that he can assume responsibility is one of the most important things a boy or young man can do for himself.

5. *It affords him an opportunity to contribute to the family welfare.* A farming program may give the student the chance to introduce many good practices on the home farm and to make improvements on the farm and around the home. Part of this opportunity comes through improvement projects and supplementary farm practices. Also, if the student can pay

his necessary cash living expenses out of his earnings from his farming program; doing so may contribute much to the welfare of the family. There is no justification for a family's being worse off because of the farming program of the student.

6. *It makes it possible for the student to advance in F.F.A. or N.F.A.* Advancement in F.F.A. or N.F.A. depends largely on what the student does in his farming program. Degree requirements include satisfactory plans for a farming program, quality of the program in operation, and the earnings and savings from supervised farming. The higher the degree, the stiffer the requirements for receiving it. These requirements are given in the manual.

7. *A good farming program contributes to one's establishment in farming.* If one is to farm, he must have certain things to farm with. Usually he must have some animals, some tools and machinery, and some cash before he can begin farming for himself, even when he rents the land to farm on. Unless one inherits or is given these things or the money to buy them, he must secure them with his own earnings. A farming program gives the student the opportunity to earn money, to build up at least small herds or numbers of farm animals, to own and overhaul certain kinds of tools and machinery, and to establish a credit rating. These things contribute toward establishment in farming. Boys and young men most likely to farm are those who have better-than-average farming programs and who have investments in farming when they leave high school.

8. *A farming program gives the student a chance to "try his hand" at farming.* This reason for having a farming program is not to be overlooked with first-year students in vocational agriculture. They often do not know whether or not they would like to farm; they have never tried it. For these students a farming program may have much value as an exploratory experience.

9. *It makes the agriculture course interesting.* A student is not likely to be interested in vocational agriculture unless he has a good farming program. Without a good farming program, the problems discussed in the classroom are not likely to be his problems. Nor is he likely to have any individual problems he cares to work on. When supervised farming is being dealt with in the class, he has nothing to challenge him, for he is an outsider.

Characteristics of a Good Farming Program. The teacher must know what constitutes a good farming program, generally speaking, and he must be able to tell wherein the farming program of a student is good or not good. Some of the characteristics of a good farming program are here enumerated:

1. A good farming program of a boy or young man is adapted to the home-farm business, making it, if possible, a better farm business. The elements of good farming should be strengthened, not weakened, by the program of the student. (Elements of good farming are listed on pages 81 to 82.)

2. It provides for the development of many of the abilities important for success in farming. This implies a degree of control by the student and an opportunity to carry out significant improved practices. It also implies that the farming program is comprehensive and of good scope, usually consisting of productive-enterprise projects, improvement projects, and supplementary farm practices. Unless the farming program provides for the development of abilities needed in farming, there is no real justification for having it.

3. It provides the opportunity to make a satisfactory labor return or profit. Usually this is necessary to interest in the program and to the program's contributing to establishment in farming. A labor return includes no gifts, so the program should be on a sound financial basis. Seldom will there be good labor earnings unless the farming program is of good scope.

4. It contributes to establishment in farming. The student

should be further along toward establishment in farming at the end of each year—through an increase in capital, equipment, foundation animals, and other things necessary in farming.

5. It can be carried out by the student, with the time and ability he has and the facilities and finance he has or will have.

6. It is a program the student is interested in. Interest is usually essential to the development of effective abilities and to the carrying out of a program in a satisfactory manner.

7. It does not interfere seriously with the home-farm income. No normal boy or young man wants to be a burden to his family. A farming program should enable the student to move definitely in the other direction.

8. There is a satisfactory agreement or understanding between the student and the father (or other landlord). Otherwise, the degree of control is uncertain and the opportunity is lost to develop many of the abilities necessary to success in farming.

9. There are good written plans for all projects, and the plans will be followed in so far as practicable. Students should learn to make and follow feasible plans.

10. There are adequate, well-kept records. Not only do students learn to keep records by keeping them, but evaluation of results is not possible without good records.

11. Under ordinary conditions a good farming program of a student includes these things as it develops (implied in the first four characteristics):

a. One or more cash projects started early in vocational agriculture and continued and enlarged over a period of several years. If a good cash crop is adapted to the home-farm business, it should be included in the program.

b. One or more feed-crop projects to produce feed for the animals in the farming program.

c. One or more livestock projects of good scope, where livestock is adapted to the farm business.

d. One or more improvement projects that will improve the farm or the farm home or contribute significantly to the family welfare.

e. Enough supplementary farm practices to develop the remaining abilities important for success in farming.

In certain highly specialized areas, only one productive enterprise may be engaged in by the farmers. Here the student might have only one productive-enterprise project.

Production Goals. It will be of much help to the teacher in guiding students in selecting their farming programs, as well as in guiding them in writing their plans later, if production standards and goals are discussed and at least some department production goals are set by the students and teacher. (Individual production and achievement goals will be set by the students as they plan their farming programs.) Students should strive to secure good crop yields and good animal production in their farming programs. Good production is a characteristic of good farming. But students at first do not know the importance of good production to success in farming and in learning to farm. Nor do they know what good production is. They often think that any kind of production is all right, particularly if it is the production secured at home. Therefore, they do not understand the necessity for using improved practices. To this extent they are "in the dark" in deciding on their farming programs. They should realize that good production and improved practices go together, both of them being necessary in a good farming program. When they do not already know the necessity for good production, what good production is in the local community, and the necessity for using improved practices if good production is to be obtained, they

can be taught these things just as they can be taught anything else. Teaching is the teacher's primary job.

"Production goal," as the term is used here, refers to a goal to be reached, not to an ideal which is seldom attained. It need not be a permanent goal; production goals can be revised at any time. If department production goals are to be arrived at, plenty of data or facts will have to be used in arriving at them. Goals cannot be set out of "thin air." There are many sources of data: projects completed in the local school, production by the better local farmers, farm-management studies, soil experiment or demonstration fields in the region, state laying-flock demonstration records, Dairy Herd Improvement Association releases, and the like. There is less need that the farm-animal data be local data than that the crop data be local. Factors in animal production are largely under the control of the producer—much more so than in crops, which depend so much on soil, temperature, and moisture.

An illustration of a production goal for corn, as set by a local department of vocational agriculture, might be:

Corn, 60 bushels per acre

An illustration of a swine-production goal set by a department might be:

Pigs per litter raised to weaning, 8
Weight per pig at 56 days, 45 pounds
Weight per pig at 5½ months, 200 pounds

(Other items could be included, such as pounds of pork per 100 pounds of feed.)

Probable Returns from Labor. It will be very helpful if the teacher figures with the class the probable returns from labor on certain enterprises, while guiding the students in deciding on their farming programs. Although return from labor is

not the only factor that should determine the choice of a productive project, it is an important factor. Figuring probable returns from labor for typical cases, which requires listing all the probable expenses and all the probable receipts, is a good way to encourage or discourage the selection of certain enterprises in farming programs. Students should always figure probable returns on their own productive projects in making their final decision to have them. Having figured probable returns as a class problem or two, the students will know how to make their individual calculations, perhaps as a part of their project plans or budget (see item 12, page 204).

Financing as Related to Project Selection. Figuring probable returns from labor will likely bring up the question of financing the projects and total farming programs. Students will probably need help and guidance in financing if they are to decide intelligently on their farming programs. Many students will have to wrestle with the finance problem before they can make their final decisions. All projects have to be financed in some way: through present ownership by the students, through outlay of cash they already have, through returns from other projects by the time the money is needed, through returns from projects that are partly self-financing, through money borrowed, through a rental or partnership agreement, or in some other business manner. Reliable students can usually finance any farming program they ought to have. However, the matter of finance needs to be cleared up for the students, and many of them need help in making financial arrangements—at the local bank, with private individuals, through the Production Credit Association, and the like. Parents are by no means the only source of financing farming programs.

Students may need guidance before they can realize that the farming program *as a whole* will have to be considered, not just part of it. They may need to borrow money to carry on

their farming programs. It is usually wise for a student to do all the self-financing he can. He should not borrow money unless he needs to. In no case should he borrow money until a sound repayment plan has been worked out so that the obligations can be met.

Guidance in Deciding on the Crop Projects. A good cash crop or crops is often very important to success in farming. Farmers have land in order to produce crops (including pasture). Cash crops ordinarily net greater returns per hour of labor than other crops. A student should usually have a cash crop in his farming program, if he can have one. It is generally safer to choose the stand-bys in the community rather than some new crop. If a new cash crop is to be chosen by the students, they should give it careful consideration in order to be reasonably sure they do not go wrong.

Whether the feed crops or the livestock projects should be considered next is not universally agreed on. Perhaps adult farmers should consider feed crops next; but boys, because of their interest in farm animals, may consider livestock next. Anyway, the feed crops usually have to be considered if there are to be livestock projects, and adjustment must be made between the feed produced and the livestock. If the successful adult farmer finds it wise to produce his own feed, so should the student in training for farming. The student will not acquire abilities in crop production nor will he follow true-to-life practices in animal production if he feeds his animals from dad's crib and haymow. The money returns from the animals will not be *returns from his labor*. Where producing feed crops is a regular part of farming on the home farm or in the community, the student does not have a well-rounded program without them.

The teacher can give the students the necessary guidance in deciding on what feed crops should accompany the livestock projects, how to calculate the size of the feed-crop projects

needed, and when to produce the feed crops in relation to the time of procuring the livestock. Often the feed crops need to be produced before a livestock project is started.

Feed-crop projects should be large enough to produce, for the student's share, somewhat more than enough feed to feed his livestock well, assuming an average season. Livestock and livestock products are produced from feed; it pays to feed liberally. Facts on the approximate amount of feeds needed for livestock must be made available to the students.

Guidance in Deciding on the Livestock Projects. There are several reasons for having livestock in a farming program if livestock is adapted to the home-farm business:

1. It is usually easier to have a good farming program if livestock can be included in it. Most livestock projects should have feed crops to go with them. The livestock and the feed crops make for a larger and better rounded program.
2. Boys and young men like to handle and care for animals. They derive satisfaction from it.
3. It is usually easier to get ahead and to build net worth if one owns livestock. A large part of the net worth of outstanding Future Farmers is in livestock. To invest money in livestock is to keep it.
4. Good livestock projects increase one's chances of making satisfactory earnings from his farming program—by his having a larger program, more diversity, and employment for more hours of his labor per year.

Students need guidance in deciding on the kind of livestock projects to have and the scope of the projects. Feed that the students possess or can produce has a bearing on the kind and amount of livestock they should have. Amounts of the various concentrates and roughages needed for the kinds and num-

ber of livestock being considered should be calculated. Facts must be available, from project records or in tables that give the approximate amounts of feed eaten by various kinds of farm animals.

Certain things will need to be considered in deciding on the particular kind of livestock project or projects to have—certain things for beef cattle, certain things for dairy cattle, certain things for hogs, and so on. Each animal enterprise has characteristics that make it suited or not suited to a farm business or to a project in the total farm business. Some of these characteristics exclude particular animal enterprises, or in some cases all animal enterprises, from consideration by the students; these animals do not belong in that section or community.

There follows a brief general sketch of the things that will need to be considered for each kind of livestock as a project. The sketch does not include probable returns from labor, as this should be considered in all enterprises, nor is personal preference for the enterprise usually listed.

Beef Cattle

1. Size of the home farm. As a rule, beef cattle are better suited to medium or large farms than to small farms. They require a small amount of man labor per animal and relatively large amounts of feed.
2. Kind of beef cattle project: whether the production of calves from one's own cows, the feeding of or grazing out of feeders, or some other kind of project.
3. Kind and amount of feed available. Beef cattle are usually kept to consume feed grown on the farm. Cows and calves up to weaning age may be produced largely on pasture and roughage, but concentrates are necessary for highly finished cattle.

4. Whether the home farm has beef cattle. This is especially important if the student expects to produce a small number of calves. It is often difficult to provide good breeding service for a few cows or heifers.

Dairy Cattle

1. Size of home-farm business. Dairying requires a large amount of man labor per cow in production. Often the size of the farm business needs increasing and can be increased by adding a few cows. One can have a dairy project under more limited farming conditions than he can have other livestock, except poultry.
2. Whether the student is willing to milk and care for the cows day after day. Before one decides to have a dairy project, he should be willing to do what is necessary to make the project a success.
3. Whether there is room for the project. As a rule, one should produce the roughage and have the pasture on the home farm. Also, he should usually produce most of the feed grain. Dairy cattle require suitable housing. If the home farm has dairy cows, there may still be plenty of room and opportunity for a good dairy project.
4. The available market. To succeed with dairying, one must be reasonably close to a good market and have transportation to it.

Hogs

1. Feed available. The student should usually have a feed-grain project large enough to provide his own grain for his hogs unless he can buy grain at a favorable price. Hogs are kept mainly to provide a market for grain or such by-products as skim milk, cracked beans, or culled potatoes. A farm that needs all the grain it can well produce to feed the other livestock it should have, should usually not keep hogs except for the family meat.

2. Pasture available. Good pasture greatly reduces the amount of protein supplement needed, simplifies the sanitation problem, and lessens the total amount of feed required.

POULTRY (CHICKENS)

1. Size of the home-farm business. Poultry requires but little land and is therefore well adapted to small farms. Without poultry it is often difficult to have good size of farm business on a small acreage. Poultry may be an important enterprise on a farm of any acreage.
2. Housing facilities. Good housing is required in most sections to produce winter eggs and to brood chicks. If houses must be built, they should be used for several years or they will be too expensive.
3. Availability of a good market. It is usually desirable to have a market better than the open market, at least from January into the summer. A specialized market for quality products is the best market for eggs or meat birds. Often one of the best egg markets is a nearby hatchery.

   It is often possible for a student to work out a partnership arrangement with his mother on the poultry flock whereby both can profit by his having the flock as a project and using good practices.

SHEEP

1. Other livestock enterprises on the farm. Sheep compete with beef cattle. Only farmers with large farms find it desirable to have both sheep and beef cattle. Sheep fit in well with dairy cattle on large farms that produce more pasture and roughage than are required for the dairy herd.
2. Amount of well-fenced pasture available for the sheep. In general-farming areas sheep must have good fencing. Except in the feed lots sheep require but little grain; they are primarily a grazing animal. They make good

use of winter small grains and winter legumes, for pasture.

3. Barns and sheds available. Suitable barns and sheds are necessary in spring-lamb production if most of the lambs are to be saved.

Guidance in Deciding on Improvement Projects. An improvement project may be in one of the crop or animal enterprises, or it may be in something else. Not all enterprises lend themselves to being carried on as productive projects. For example, an enterprise may be consumed by the family, making it undesirable as a productive project. Such is usually the case in home gardening. It may be the case with poultry, or dairy cows for the home dairy, or hogs for home meat. But improvements usually need to be made in such enterprises. If abilities in farming ought to be developed in these areas, lack of motivation on the part of the students is the only thing that stands in the way of their taking them on as improvement projects.

There may be other crop or animal enterprises in which abilities need to be developed but which, for some reason, cannot be undertaken by students as productive projects. The students may be guided into choosing such enterprises or aspects of them that need to be improved and in which the students need experience. The scope of an improvement project should be broad enough to involve planning and the adoption of several improved practices, and it should extend over a considerable time.

Many farm operations cannot be classed as crop or animal. Farm shopwork or farm mechanics, soil improvement, and home improvement are examples. Abilities in farming need to be developed in many of these areas, and can well be developed through improvement projects. Guidance by the teacher is usually necessary in choosing such projects. The teacher

should remember that the students lack experience in deciding on such undertakings and therefore are not capable of making the decision alone.

Guidance in Deciding on Supplementary Farm Practices. These practices are for developing abilities in farming that will not be developed through the projects or classwork and will not be satisfactorily acquired by pick-up methods. The fact that they are *supplementary* calls for teacher guidance. Stress is usually put on the projects first, and rightly so. Students and teachers are busy deciding on, planning, and carrying out the projects. Supplementary practice is likely to be neglected. These questions may fail to be asked: What other practices do we need to learn? What other improvements need to be made at home?

Deciding on the supplementary farm practices usually extends over the entire school year; often only one job or practice at a time is decided on. The student frequently decides in class that he needs the supplementary practice, when that subject is being dealt with. He may decide at home when the need for doing the job is discovered. The teacher can guide the student at both of these times. If he knows the home-farm situation, the teacher can often cause the student to realize the need for the supplementary practice and give him the necessary encouragement as the group problems are being solved at school. Possible practices and applications should nearly always result from group problem solving. As the teacher supervises the farming program of the student on the home farm, he should see many an opportunity to influence the student to take on supplementary farm practices.

The whole matter of supplementary farm practices—what they are, their importance, etc.—should be discussed with the students when farming programs are being selected.

Relationships with Parents. Students cannot select their farming programs, to be carried out on the home farm, without the

cooperation of their parents. The teacher should take definite steps to acquaint the parents with supervised farming as a part of vocational agriculture, before the students begin to select their farming programs. He should not depend on boys to inform their parents. Supervised farming is not a simple concept; it takes a teacher a long time to acquire the concept in his training. The beginning boy's understanding of it is usually very meager.

Many successful teachers discuss supervised farming with the parents at a group meeting or series of meetings arranged for this purpose. Usually more than one meeting is desirable because supervised farming is related to all of vocational agriculture—course of study, method of teaching, the need for agricultural education, etc. There will be a great deal to discuss with many illustrations of good farming programs, good parent cooperation, good achievement, and the like. These meetings can be exceedingly helpful. Project tours may be conducted, with parents of beginning students going along, to develop the parents' understanding of farming programs. Circular letters sent to parents may be helpful, especially to supplement the group meetings, project tours, personal visits, etc.

The teacher must begin early and must keep on working at developing cooperative relationships with the parents. Parents are interested in their sons; they want them to succeed. Most parents want their sons to have as good an opportunity as the sons of other parents. Of course, the teacher will need to visit the parents on the home farms. Nothing can take the place of personal visitation. The first visit must not be delayed until the student's farming program is already decided on. Cooperation of the parents is vital when the program is being selected and arrangements are being made for it.

Other Teacher Responsibilities. The teacher has many important responsibilities in guiding students in deciding on their

farming programs. To get good farming programs chosen is half the battle in succeeding with supervised farming. Several responsibilities have already been enumerated or strongly implied in this discussion. Here are a few others:

1. The teacher himself should understand the values and purposes of supervised farming. He must realize the fundamental importance of supervised farming in teaching agriculture.
2. He should be enthusiastic about supervised farming. The students are not likely to be more enthusiastic than the teacher is. Students tend to reflect the attitude of their teacher.
3. He should use several group problems whose solving will be helpful to the students in deciding on their farming programs. References that bear on the subject should usually be available.
4. As early as possible he should go over the entire farm situation of each farm from which a student comes, find out what factors are limiting the success there, and decide in his own mind how these factors may be corrected. This is necessary if the teacher is to intelligently guide the students in deciding on their farming programs. Students themselves should assemble the home-farm facts needed for such an analysis; they will need them in making their decisions.
5. He should see that the farming programs are selected early. Early decisions are necessary if the classwork is to contribute to the success of the farming programs, and vice versa.

Making Arrangements for the Farming Program

Before boys and young men can know for sure what their farming programs will include, they have to make arrange-

ments for them. Obviously, arrangements are necessary to the final decision to have a particular program. Having arrived at them, they become a part of the farming-program plan (see item 11, page 204). Making arrangements for the farming program is a business proposition. Much of the success of a program depends on how wisely and well the arrangements are made. A clear understanding between the student and the parent (or other landlord) at the beginning of the program helps prevent misunderstandings later. With a clear understanding at the beginning, the student can go ahead with planning what he will do and how he will do it; he knows what he can do and what he cannot do. He also knows what things he can have with which to carry on his program.

What the Understanding or Agreement Should Include. The understanding or agreement should state clearly the student's responsibilities in his farming program, indicating what he is to furnish and what he is to do. It should also include any division of the products or returns—what the parent is to receive and when, and what the student is to receive. None of the following things that apply should be overlooked: size of each project, the land that is to be used, financing, equipment, housing or storage, division of each kind of by-product, horse labor or other power, feed and pasture in animal projects, fertilizers and manure in crop projects, seed or plants, insurance, marketing costs, and how long each project will run if not already known by its nature.

Except in rare instances, such as a home agriculture-library project, improvement projects should be agreed on just as the productive-enterprise projects are, stating what the parent is to furnish or do and what the student is to do.

Arriving at Fair Rental or Share Agreements. The understanding or agreement on the farming program should be fair to each party concerned. Fair (equitable) rental or share agreements between student and the parent (or other landlord)

are not always easy to arrive at. Just what is fair is not always known. The student can furnish certain things in a productive-enterprise project; the parent can furnish certain other things. Perhaps it is usually fair to divide the products or returns between the student and the parent according to the part of the total cost of production which each furnishes. For example, if the student furnishes half of the total cost of production (which includes his own labor), he should receive half of the products or returns. If he bears 40 per cent of the cost of production, he should receive 40 per cent of the products or returns.

Tables on cost of production and on income from various sources adapted to the local type of farming are helpful in arriving at fair rental or share agreements. Illustrations of such tables are shown on the accompanying pages. No one set of figures will fit all sections of the country.

How to Use the Tables. Take dairying, for example. Suppose that the student has enough young animals so as not to expect any depreciation on the total animals in his project. His cost-of-production percentages are in the second column of the dairy table. If he owns the cows and furnishes them and the man labor only, he should have approximately one-third of the returns. If he owns the cows and furnishes the labor and all the feed except pasture, he should have approximately three-fourths of the returns. By looking at the income percentages, it may be seen that the manure will pay for the use of buildings. Or the skim milk in butterfat production will pay for the pasture and use of buildings. Thus if the parent (or other landlord) will accept the manure for the use of buildings or the skim milk as pay for the pasture and use of buildings, either of these would be a fair trade.

Such a table as the tobacco table makes it easy to figure what part of the total cost of production the student furnishes

DAIRY COST-OF-PRODUCTION PERCENTAGES *

Item of cost	Per cent of cost of production (if the cows are 6 years old or over)	Per cent of cost of production (assuming no depreciation on total animals)
Concentrates	19	21
Roughage	17	19
Pasture	11	12
Total feed	47	52
Man labor	24	27
Depreciation on cows	10	
Interest, taxes, and insurance on cows	5	6
Buildings	5	6
Equipment	2	2
Bull service	2	2
Veterinary, medicine, and bedding	3	3
Horse work	2	2
Total	100	100

* Hammonds and Tabb, *Your Farming Program*, Trafton Publishing Company, Lexington, Ky.

INCOME PERCENTAGES FROM BUTTERFAT PRODUCTION

Source of income	Amount	Per cent of total income
Butterfat, 225 lb. at 48 cents	$108.00	67
Skim milk, 5,000 lb. at 50 cents per hundred	25.00	15
Veal, 110 lb. at 15 cents	16.50	10
Manure, 6.5 tons at $2	13.00	8
Total	$162.50	100

INCOME PERCENTAGES FROM WHOLE-MILK PRODUCTION

Source of income	Amount	Per cent of total income
Whole milk, 6,000 lb. at $3.30 a hundred or 28.4 cents a gallon	$198.00	89
Veal, 90 lb. at 15 cents	13.50	6
Manure, 6½ tons at $2	13.00	5
Total	$224.50	100

TOBACCO, BURLEY, COST OF PRODUCTION PER ACRE

(Assumed Prices per Unit as Given)

Item of cost	Amount	Price per unit	Total amount	Approximate per cent of cost of production
Man labor	300 hr.	$0.40	$120.00	41
Horse work	90 hr.	0.20	18.00	6
Steaming	200 sq. ft	3.00	6.00	2
Canvas (per year)	20 yd.	0.10	2.00	1
Spray materials	3 lb.	0.50	1.50	0.5
Barn and sticks			25.00	9
Machinery expense			6.00	2
Fertilizer	1,000 lb.	3.00	30.00	10
Coke			15.00	6
Land	$400 *	15%	60.00	21
Insurance	$250	$2.00	5.00	2

* As Burley land is limited, perhaps the value of land per acre is usually at least twice that of the average for the farm.

and what part the parent, to throw light on how the returns from a crop project should be divided.

Shall the Agreement Be Written? The agreement or understanding must be clear to both the student and the parent or other landlord. To be clear, it must be complete. It is more likely to be clear, important points are less likely to be overlooked, and there is less chance of misunderstanding later if the agreement is written. Writing an agreement is good business and good business training. When a satisfactory agreement is written in clear simple language, the student understands it, the father and the mother understand it, and the teacher understands it; *it can be checked.* All the persons concerned should understand the terms of the agreement, else it is not an understanding. The written agreement also serves as a record.

These statements do not mean that the agreement has to be written. But an agreement there must be, and it should be clear.

Forming a Partnership in Certain Enterprises. A student may have a productive-enterprise project without sole ownership of it. The project may be on a share or partnership basis. It is not always practical to separate a sow-and-litter project from the rest of the hogs, or to have a separate project in sheep when there are other sheep on the farm, or a separate project in egg production when there are other hens on the farm. It is often possible to have a much larger project on a partnership or share basis than with sole ownership. For example, it would often be as easy to make arrangements for a thirty-ewe sheep project and share one-third in the returns as to make arrangements for a ten-ewe project on a sole-ownership basis. Or it might be as easy to make arrangements for sharing one-half in a 10-acre corn project as to make arrangements for a 5-acre corn project with sole ownership. Of course, a student should not take on a larger project than he can handle well.

Nor should he have a partnership project in which he has little or no control.

To form an enterprise partnership with the father when the son is ready and capable of doing so is often a good way to "grow into farming." It solves many of the financial problems of the son. It also makes for good father-and-son relationships. The practice of fathers' taking sons into partnership in farming is increasing.

Writing Project Plans

Careful planning by the students and careful checking by the teacher are essential to the most rapid progress in teaching-learning through practice. Thinking is a necessity in planning. In thinking, mental reactions are made; they can be examined, evaluated, and accepted or rejected as satisfactory or not. Planning gives opportunity for the false mental "moves" to be detected and eliminated before they are carried out. The overt acts or practice can then be of the correct kind. In this way correct practice is learned. There is not much likelihood that knowledge will be bound with agricultural practice unless it is bound with it in the planning. It is during planning that most of the mental activity goes on. Ordinarily, the student is then at school with the teacher. Careful planning by the student and checking by the teacher save time in supervision. They make it unnecessary, and even undesirable, that the teacher be at the elbow of the student at every stage of the practice. (Also, see statements on planning, page 168.)

Many farming programs fail because definite and complete plans have not been made for them. One does not start to build a house until he has a plan to follow. Almost anything that is to be done well should be carefully planned.

Most of a student's farming program is usually made up of projects (except in placement for farm experience). Each project must be planned as part of the total farming program.

Certain phases of planning have already been discussed. It is not possible to separate planning from deciding on the farming programs and making arrangements for them. These are aspects of planning. To the extent that the student has selected his farming program and made arrangements for it, set up his production goals or other goals, and figured his probable returns from labor or made out his budget, his plans are already made. These are by no means all a good plan consists of, however.

Project plans should be written. Writing is necessary to a clear plan. If the student does not write his plan, he usually does not know how hazy it is. Also, he often overlooks something very important to success, and he may forget what he planned to do before the time comes to do it. The teacher cannot very well check a student's plans, nor can anyone else, unless they are written. Plans need to be carefully checked soon after they are made if the teacher is to direct the learning, if he is really to supervise the practice.

What to Include in the Written Plan. The project-plan concept is very different from state to state. However, the plan, whatever name it may have or without a name, usually includes: size or scope of the project, arrangements, calculations on probable returns from the project (sometimes known as a budget), method of financing the project, and clear statements on the improved or approved practices to be used.

Many record books have in them a place for the project plans. Sometimes the plans are in the notebook or in a separate plans book. Or parts of the plans may be in one book and parts of them in another. It seems desirable to have a uniform system throughout a state.

The student is bewildered when asked to write a project plan without guidance as to what to include in it. What a good plan includes, as conceived in his state, should be made

clear and plausible to him. The outline below may be suggestive of what to include in a project plan of a high-school boy. It may be used for a crop project or an animal project. The statements are in terms of the student.

1. Name of enterprise, and size or scope of project
2. Production to be secured
3. Reasons for choosing this project
4. Where the project is to be (where the crop is to be grown or the animals are to be kept)
5. Where secure the animals (animal project). Where secure the seed or plants (crop project)
6. When begin the project
7. Securing feed (animal project). Securing fertilizer, lime, or manure (crop project)
8. Labor. (State whether you will do all the work yourself; if not, what other labor you will use.)
9. Tractor or team, and tools and machinery (what you will need; where you will get it)
10. Marketing (how you will dispose of your product)
11. Rental or trade agreement. (Be specific as to who will furnish what and who will receive what.)
12. Probable returns from the project. (List all probable expenses and all probable receipts. The difference between the two is your probable returns.)
13. Financing the project. (With your rental or trade agreement–item 11–and your probable returns estimated–item 12–state here how you will finance this project.)
14. Use of money to be made from the project
15. Improved farm practices to be followed. (State clearly and specifically the improved practices you will carry out, job by job. Do not list practices that you will not follow.)

The First Fourteen Points in the Outline. The first fourteen points in the above outline for writing a project plan constitute the business side of the project. They clinch the decision to have the project. These fourteen points should be written early. Only when the business side has been attended to can the student be very sure that he will have the project. Only then is he ready to begin to decide on the improved practices he will use.

The improved practices are usually decided on as the different divisions of the enterprises are taken up in class, assuming the enterprise is in the course of study for that year or assuming they are taken up in the group discussion in supervised farming. If important aspects are not discussed in class, students can plan the practices on individual-problem days throughout the year, being sure to plan each improved practice before time to carry it out.

Students must be taught to list only the practices they intend to use. They are not to write what *should be* done or what *has been* done. A plan is futuristic. The statements must be specific. Such expressions as "plant the seed fairly deep," "spray to control insects," "breed the sow in the fall," "feed a balanced ration," and "use a disinfectant" are worthless in a plan. The student is no better off having written them.

Keeping Records

Keeping records cannot be justified unless the records are useful to those who keep them. Although records are a part of any good farming program, students should not be asked to keep them until they see why records should be kept. It is the responsibility of the teacher to teach the students that records should be kept and how to keep them and use them. Record keeping should not be approached as a requirement or necessary evil or as something uninteresting or distasteful.

Records are good things to have; there are valid, plausible reasons for keeping them.

Here are some of the reasons for keeping records on a farming program, from the student's standpoint, most of which the students already know and can contribute in a group discussion:

1. Records enable one to tell how much he made.
2. They provide the facts so that one can tell how much it cost to produce the product or a unit of the product.
3. From records on production one can tell where he has been efficient and where he has not been efficient in the production.
4. Records provide facts useful in setting up or revising production goals.
5. With facts at hand from the records, one can compare his results with the goals set up or established and with similar results by other students.
6. Records on enterprises make it possible for one to do a better job of planning his next enterprise.
7. One learns to keep farm records by keeping records on farming programs.
8. Records provide facts useful in figuring probable returns or making budgets. Thus they are helpful in selecting farming programs.
9. Good records are helpful to one in borrowing money.
10. Well-kept records made a good impression on the parent or other landlord. The father will be more likely to take the son into partnership with him or give him better opportunities in other ways, if the son keeps good records.
11. Keeping records helps one become a good observer in

agriculture. It causes him to observe things that he would otherwise not be aware of.

From the teacher's standpoint, and in the end benefiting the students, data from records provide valuable teaching materials for use with all groups taught. Records also have guidance value and course-building value, and are helpful to students in setting their achievement goals. Not to be overlooked, records are valuable to teachers in justifying their own existence as teachers of agriculture; they constitute some proof of accomplishment. They may lead to improvement in teaching.

Kinds of Records to Keep. The kinds of records kept by students vary from state to state, each state having its own system of record keeping. Records should achieve the values or purposes for which they are kept. The kinds of records kept should depend on the uses to be made of them; records should not be ends in themselves. Using records is dealt with later in this chapter.

What records to keep should be discussed with the students before they are expected to start keeping them. The students themselves, in a group discussion, will be able to name most of the records that should be kept. They can be led to name any necessary records they had not thought of and to see the reason for them. Then, when the students realize that the record book they are to use is designed for keeping records on the very things named by them, they accept it as a good and useful record book; they are glad to have a copy.

While the kinds of records vary, these records are usually kept:

1. Inventory
2. Record of sales or receipts
3. Record of expenses

4. Labor record
5. Record of supplementary farm practices

Production records may be kept in certain enterprises such as in egg production or milk production. The production must be known if efficiency of production is to be arrived at. Total production may be arrived at in some cases from the sales or receipts record.

Most record books used by boys and young men are set up so as to keep cost accounts on the productive enterprises. This practice has much to commend it for teaching-learning purposes, which is the chief reason for having farming programs. The entries to be made should be those which will provide the data for making the summaries desired. A record book that makes possible the keeping of cost accounts and the summarizing of the farming program as a whole is entirely feasible. Several states use such a record book (among them Kansas and Kentucky).

A diary kept by the student is helpful in making entries in the record book proper. Also, the diary usually provides data and other information that would not ordinarily be entered in the record book but that are valuable in analyzing results. This is particularly true of special events or happenings such as breeding dates, birth dates of animals, weights at given periods, frost dates, death losses, change of feed.

Records on Improved Practices Used. It is desirable that a record be kept of the improved or approved practices carried out in the projects. Such a record is not difficult to keep if the practices to be used are a part of the project plans. Then it is only necessary to check the practices that are carried out, indicating any deviation from the practices as planned.

Records on Improvement Projects. To the extent that the improvement projects lend themselves, perhaps about the same records should be kept on them as on productive-enterprise

projects. There is this important difference: any inventory, expenses, or sales receipts are usually those of the parent rather than the student. But if the summary of the project is to make use of these facts, records must be kept on them.

Teaching Students to Keep Records. A teacher must not assume that students know how to keep records. They must be taught. How to keep records should be handled in class as one or more problems, which it should have become. The different kinds of records to be kept by the students will need to be considered, one by one—the inventory, record of sales or receipts, record of expenses, etc.—with reading on them, illustrations, and other teaching techniques being used. Teaching good practices in keeping records is perhaps no different from teaching any other improved practice in farming, which is outlined on pages 167 to 169.

Here are a few things in record keeping that beginning students will almost surely need to learn:

1. To make entries specific and complete. Failure to do this is one of the most glaring weaknesses in records as often kept. "Feed bought" is not a specific or complete entry. It does not tell what kind of feed or how much feed or the price per unit or when the feed was bought. To say only "milk sold" or "eggs sold" is almost as bad.
2. What to include in the beginning inventory and what to include in the closing inventory. Perhaps, also, what *not* to include.
3. Effect of an entry in the inventory—a *charge* if in the beginning inventory, a *credit* if in the closing inventory. Apparently this is difficult for students to grasp. Careful teaching is necessary.
4. How to estimate depreciation and appreciation in the closing inventory, particularly depreciation.

5. To record all the expenses, not just part of them. If cost-account records are kept, all the cost items must be entered, including the items produced on the home farm or in another project. No economic good or service is ever to be treated as free.
6. How to calculate and enter interest on investment as an expense or charge.
7. How to figure, or what to charge, for buildings or storage not in the inventory, use of land, tractor or horse labor, trucking, manure, and skim milk or other by-products used.
8. How to enter expense entries on share-agreement projects where the parent or other landlord gets a certain part of the product or returns because he furnishes certain things.
9. To enter "chore" self-labor properly.
10. How to enter exchange or "traded labor."
11. How to keep production records or other special records that are to be kept.
12. How to keep records on improvement projects.
13. How to keep the records on supplementary farm practices.
14. How to keep and make use of a diary in record keeping.
15. When to make the entries—whether at school, whether at some definite time at home, etc.

Summarizing, Interpreting, and Using Records

If records are not to be summarized, interpreted, and used, they might as well not be kept. Summarizing records is necessary to interpreting them and to making use of them. Without a summary, the student cannot know how much he made on a project; he cannot know the cost of production; he cannot know how efficient he was in the project. Of course,

the summary can be no more accurate than the records that have been kept.

Summarizing Records. The kind of summaries called for in the record book is different from state to state. In some states the record book provides for summarizing the total farming program as well as each project separately. Record books for use by high-school students usually have a place in them for summarizing each project. A project should be summarized immediately after it is completed. Continuation projects should be summarized once a year.

Usually there are three parts to a project summary: (1) financial or general summary, (2) cost-of-production summary, and (3) efficiency factors. The parts are not always known by these names.

The Financial or General Summary. The chief aim of this summary is to find out the income or returns on the project. It usually calls for a summary, by kinds, of products sold, expenses, labor, and the like. There is usually a place on the summary sheet for listing the receipts or credits (two names for the same thing) and for listing the expenses or debits or charges (all names for the same thing). The total expenses or charges can then be subtracted from the total receipts or credits in order to find the income or returns from the project.

What to list as receipts and what to list as expenses in the summary are usually made clear in the record book, also the manner of handling the beginning and closing inventory.

All receipts or credits and all expenses or charges on the summary sheet should come from the proper record sheets. They are not to come from nowhere. A summary is a summary of the individual entries.

The Cost-of-production Summary. The financial or general summary is usually completed before cost of production is arrived at. In figuring cost of production, the student is not trying to find out what he made on the project. Rather, he is

trying to find out what it *cost to produce* the product. Students have difficulty in learning the difference between these two things. In order to calculate cost of production, all the expenses or charges in producing whatever was produced should be listed. Nothing of economic value is ever considered as free in cost of production. The cost or value of only the things actually used in the project should be listed. For example, the student should list only the value or cost of the feed used, regardless of how much feed was bought or how much was in the opening or closing inventory.

Since all the expenses or charges are to be included in arriving at cost of production, value of self-labor should not be overlooked. All labor on a project has value whether it is paid for or not. If labor is not included, the cost of production must be labeled "not including labor."

Any depreciation of productive animals is a cost-of-production item in an animal project. Depreciation on equipment or buildings owned by the student is a cost-of-production item unless a charge is made for the equipment or buildings that includes depreciation.

Interest on investment in conducting a project is an item of cost of production whether money is borrowed or not. Care must be taken, in case a full charge is made for use of equipment or buildings, not to include the amounts invested in them when figuring interest on investment. Full charge for them includes interest.

Adding all the expenses or charges in cost of production gives the total cost of producing everything that has been produced. It gives the *total cost of total production.* Often more than one product has been produced—perhaps a main product and some by-products. There may have been *appreciation* of productive animals in an animal project. Animals may have been disposed of which accounted for some of the cost of production but which were not a main product. There

may have been a gain in value of equipment on which self-labor and other expenses have been included. The total value of all the by-products must be subtracted from the total cost of production if cost of producing the main product is to be known.

The Efficiency Factors. The summary sheets may call for several efficiency factors to be calculated. As the name implies, an efficiency factor is an indication of the efficiency or success of the project, particularly when compared with other projects or measured by standards. Some common efficiency factors are yield per acre, production per animal, cost of producing a unit (pound, 100 pounds, bushel, etc.), amount of feed to produce a unit or to grow animals to a certain weight or age, feed cost of producing a unit, selling price per unit, returns per dollar's worth of feed, income per hour of labor, hours of labor per acre or other unit, percentage lamb crop, percentage of pigs or chicks raised. All the efficiency factors in the achievement goals should be calculated so that the student can check on the attainment of his goals. How to calculate most of the efficiency factors is quite obvious, but not all of them.

Cost of producing a unit of the main product can be calculated only after the total cost of producing the main product is known. One cannot very well calculate the cost of producing a unit other than a unit of the main product. For example, if cotton lint is the main product, one cannot calculate the cost of producing the cotton seed; if whole milk is the main product, one cannot calculate the cost of producing the calves dropped; if spring lambs are the main product, one cannot calculate the cost of producing the wool.

Calculating *returns per dollar's worth of feed* is not always easy. One must first know what the total returns were. He must consider the increase or decrease in the value of animals, including any animals bought after the project started, and

he must not overlook any credit from the sale or use of animals and animal products.

Feed cost of producing a unit is an important efficiency factor, the calculating of which may give some trouble when by-products are produced in an animal project. If by-products are produced, some of the feed is used in producing them. The student should already have calculated his total cost of production and his total cost of producing a unit of the main product. He should now realize that feed cost is a fractional part of the total cost of production; then he will probably know how to figure the feed cost of producing a unit. Example: If the total cost of producing a pound of pork is 12 cents and if the feed is three-fourths of the total cost of production, the feed cost of producing a pound of pork is 9 cents.

Summarizing Improvement Projects. Crop or animal improvement projects carried on as a complete enterprise can be summarized in the same manner as productive-enterprise projects. There may not, of course, be any student income. But usually there is income or profit to the parent or other landlord. The cost-of-production summary and the efficiency factors in such projects are no different from those of a productive project.

In some kinds of improvement projects there is no tangible production or income to anyone. Then, the summary form may need to be changed somewhat in order to summarize the project. Usually the expenses or charges can be listed, as can self-labor, and the improvements can be enumerated. The summary may need to be supplemented by an explanation and description of the improvements made, with perhaps some pictures. Some record books have a place in them for the "story of the project," which may include such an explanation and description.

Careful Checking Necessary. The teacher must not assume that students will do a good job summarizing their projects.

Project summarization should be taught; the teacher should give supervisory help in summarizing the projects. He will also need to check carefully, or have some capable person check, each summary to see that it is a summary of the entries made in the records, that the calculations are correct, and that the summary is complete.

Interpreting Records. To interpret is "to get at the meaning of." It is not enough that the student make several calculations and know how the project turned out. He needs to do some comparing in order that his results may take on meaning. He needs to answer such questions as these:

1. How do my results (income, yield or production, cost of production, feed cost, returns from feed, price received, etc.) this year compare with my results of last year?
2. How do my results compare with those of other boys or young men in the department or class?
3. How do my results compare with those of adult farmers in the community or with results published in books and bulletins?
4. How does my cost of production compare with the price received or the market price?
5. How does my production or yield compare with my production goal or the production goal of the department?
6. Did I make as much money as I expected to make when I selected the project and figured probable returns?

Why the Results Were What They Were. The student should want to know the chief causes of his results, both for the satisfaction of knowing them and in order to profit most from what he finds out. Some of these causes are likely to be revealed only when there are several projects of the same

kind and the facts from them are placed on a chart or the board where they can be inspected.

Certain practices used probably influenced the results. Where there were several projects of the same kind, find out, if possible, what practices apparently helped most in securing satisfactory results and what practices interfered. This calls for a comparison of practices used and of results secured.

A convenient and good way to compare results and to compare practices used by different students is to have, in chart form, an "end report" for the enterprise. This is simply a table of the projects of the same kind, showing important facts about them. Such a table permits the results from the different projects to be studied, compared, averaged, etc. Also certain conditions, situations, and practices may be shown. A large sheet of paper, or possibly the blackboard if room can be spared long enough, may be used in making the end report, with one line for each student or project and as many columns as there are different kinds of items to be shown. It is a good practice to develop the chart as the summaries are completed. This stimulates the students. A group discussion of such an end report when it is finished will be very helpful to the students in determining the causes of the results secured and in planning improvements in future projects. If the class or department has production goals, the students can tell from the averages on the chart whether the goals have been reached.

Using the Records. To interpret the records, which we have just discussed, is, of course, to make a use of them. The main reason for keeping and interpreting records is to improve the work in the future by using what they show one. Records reveal the strong and the weak points in the projects. They give a kind of "knowledge of success and failure" which is important to learning. Knowing their weaknesses, students can correct them. For example, if the records showed that a

student's pork production per sow was low and that it was caused by poor gains of the pigs, he could then determine what caused the poor gains and remedy that weakness in his next project. Making such use of project records pays big dividends. By keeping and improving the good practices used and by changing the poor practices to good ones, the returns can nearly always be increased.

The teacher should be alert to guide the student to use his records. The student will have opportunity to use them in figuring probable returns or preparing budgets, in making business arrangements for farming programs, in financing his program, etc. He can often use them to advantage in solving a problem in class and in making contributions to class discussions in various ways. He may use them to prepare an article for the local paper or school paper.

End reports and other data from project records are excellent teaching materials for use with all groups taught and with individual students. Using such material in teaching helps cause the students to see the value of records. End reports should be useful in setting or revising production goals and other achievement goals. They can also be used by the teacher as a basis for worth-while articles in the local paper. They may be used to cause the students to have a greater appreciation of accurate records. Students should have an opportunity to discuss the need for well-kept records to supply the information reported on.

It is often possible to use project records before the projects are completed. The sooner the records are used, the greater will be the amount of their use. "Progress reports" of many kinds are possible and are motivational when comparisons are made while the projects are in progress. Monthly reports can be made on egg production, butterfat or milk production, and gains by various kinds of animals. Pig weights at 56 days or

other ages can be reported, as can pigs saved per sow. Broiler weights week by week can be reported. Frequent reference should be made to the goals set and the extent to which they are being reached as shown by the records. Attainment can be compared with figures such as those in the following table on weight of pigs at various ages:

Age of pigs, days	Good weights, pounds	Superior weights, pounds
60	40	50
90	70	85
120	110	125
150	150	180
180	200	240
210	245	295

Source: Anderson, *Swine Enterprises*, J. B. Lippincott Company.

Tables may be found on average weight at various ages of chickens and of turkeys being raised; on weights of lambs at different ages; and on egg production per hen by months to produce a certain number of eggs for the year.

Supervising Farming Programs on the Farm

This section of the chapter deals with supervision *by visitation* to the home farm (usually) or other farm where the student lives and works. Supervision by visitation, of course, cannot be divorced from the guidance and direction given the students at school which relate to their farming programs. These forms of guidance we have already discussed. Visitation is necessary in guiding students in selecting their farming programs, in planning them and making arrangements for them, and in carrying them out. It is necessary to teaching vocational agriculture; instruction at school is not enough.

Giving the necessary supervision on the farm is the responsibility of the teacher. The greater the number of students, the greater the total responsibility.

The farming program of the student and the supervisory visits are for the benefit of the student—his development, his growth, his learning, primarily. Since this is true, the teacher should realize how important the following things are as he makes his supervisory visits:

1. That the student *succeed* with his farming program. Success is particularly important in the first farming program of the student. If the student succeeds, he is proud of what he has done and glad that he put forth the necessary effort to succeed; he gains confidence in himself, and is more willing to undertake other difficult tasks. He will likely want to do the successful thing again. Success in the farming program of a student also increases the confidence of his parents that he will accept responsibility and will do a piece of work well; it usually becomes easier for him to arrange for a still better program and to use other improved practices.

2. That the student be *responsible* for his farming program. If someone else is responsible for the farming program, it is not the student's program. The student should do the work himself or arrange with others for the necessary help. His parents should neither do the work nor have to remind him of what needs to be done. It is the student's responsibility to see that the work is done when it should be done. The student should know how to do the work. He should decide what practices are to be used. (He may, of course, consult others.) The student should be responsible for having on hand, when needed, the things necessary to carry on his program, such as seed, fertilizer, and feed.

3. That the student use significant improved farming practices in his program. Unless the better farming practices are

used and learned, there is little justification for having a farming program. The student will learn a good practice only if he uses it. Success with a farm undertaking is usually caused by the practices followed.

4. That success in farming with boys and young men is not possible without the confidence, respect, and cooperation of the parents. These things cannot be gained without acquaintance with the parents and unless the parents understand what the teacher is trying to do.

5. That he (the teacher) be familiar with the home-farm situation. A teacher cannot intelligently guide the student in selecting a farming program or in carrying it out unless he is familiar with the home-farm situation. To guide, one must know the way, he must be on familiar ground.

6. That he continue to *teach*. This is the teacher's great opportunity to do individual teaching. Supervision is largely a teaching process. Teaching on the farm is a major part of good supervision.

Purposes of Supervisory Visits. Some of the purposes of supervisory visits are implied in the six things just listed. The teacher should make a visit in order to accomplish definite purposes. He should go to the home farm (usually) of the student to do one or more of the following things:

1. Gain the confidence, respect, and cooperation of the parents. This is necessary before farming programs can be selected and carried out.

2. Guide the student in selecting his farming program, and perhaps in making arrangements for it. Decisions at this point "set the pattern" for everything that will be done later. Deciding on a farming program is a continuous process once there is a program; the next program is always being decided on, as are the supplementary farm practices in the present program.

3. Render a service to the student in planning his farming program, particularly in getting phases of the business arrangements made for the projects.

4. *Teach* the student—develop manipulative abilities, other abilities needed in farming, attitudes, understanding. Such teaching may or may not be a "follow-up" of the instruction at school.

5. Help the student overcome the difficulties or obstacles that interfere with the success of his farming program. It may be the difficulty of how to meet a changed situation, or of not knowing how to carry out a practice which at school seemed clear, or of procuring something needed in his farming program. The parent may have questioned some practice. Many things can interfere with the success of a farming program.

6. See that the student is ready, or help him get ready, to meet crucial or critical stages in some part of his program. Is the student ready to save the pigs that will be farrowed or the lambs that will be dropped? Is he ready for the baby chicks to arrive? Is he prepared to apply a particular spray?

7. Help the student evaluate what he is doing—his progress, his successes, his shortcomings. It is futile for a student to practice in the absence of a knowledge of results. The teacher may discover errors or weaknesses in what the student is doing that interfere with success but that are not apparent to the student. These can be remedied or overcome. The teacher may confirm the things done well, which promotes learning.

8. Determine how well the plans are being followed and see if the student knows to do, and how to do, the significant things that will need to be done soon. Plans should be useful. They are useful only if they are used.

9. Check the records for completeness and accuracy. If the teacher does not see the records, a student has ground to as-

sume that records are not important. A student wants the teacher to see his records if they are well kept. Seeing them on each supervisory visit promotes their being well kept. Not keeping the records up to date should be detected early. When a student gets very far behind with his entries, completing them is nearly always a distasteful task, detrimental to a good attitude toward keeping records.

Teaching during a Supervisory Visit. Supervision is so largely a teaching process as to justify the following outline, even though there is in it some duplication of what has already been presented.

A supervisory visit on the farm gives the teacher these teaching opportunities:

1. To follow up the class instruction (group or individual). He can get additional applications made of the decisions reached in class and a greater number of improved practices followed by
   a. Causing the student to see applications that can be made of class decisions
   b. Helping remove difficulties in the student's thinking that keep him from using the practices
   c. Helping the student gain confidence in his ability to do the job
   d. Helping him avoid errors in his practice or avoid the wrong kind of practice. Thus much failure is prevented.
   e. The teacher can also carry the instruction beyond the class instruction, especially with the more advanced student.
2. To help the student understand the basic science of agriculture by having him observe it in natural situations. Examples—the function of different plant nutrients in

plants, as how nitrogen stimulates leaf growth or how phosphorus stimulates seed formation and early maturity; the physics of erosion, such as the speed and volume of water eroding the land with gullies starting 60 to 100 feet from the top of the grade; genetics, such as "like tends to produce like."

There are many occasions when the teacher should point out, call attention to, or in some other way get the student interested in the principles of science involved in what takes place on the farm.

3. To help the student evaluate the practices or results in his farming program. The student can know what the results are—measure or help measure production, see the results himself, and understand what caused them. He will tend to gain confidence in what he has done that is right, and will want to avoid his mistakes.
4. To teach individually those things which cannot be handled readily in class by group or individual instruction

Suggested Teaching Procedures and Techniques

1. In teaching manipulative abilities, use much the same procedure as that outlined for group teaching on pages 149 to 152.
2. In getting application made of things dealt with in class:
   a. Go over with the student the decision in class.
   b. Discover what difficulties are keeping the practice from being used.
   c. Lead the student to see how these difficulties can be removed.
   d. Lead him to decide how he can use the practice in his situation.
   e. Give him encouragement where needed; build up confidence.

3. In solving problems discovered by the student:
   a. Cause the student to analyze the situation that gave rise to the problem. Ask questions and make observations where necessary.
   b. Have him propose possible solutions or examine possible solutions proposed by the teacher.
   c. Supply information if needed, but have the student recall the information he has. Make use of past classwork to supply this information.
   d. Lead the student to decide on the solution. Sometimes impractical solutions must be eliminated by thinking them through.
4. In solving problems not yet discovered by the student (but the difficulties are discovered by the teacher):
   a. Go over the situation with the student so that he can see what the situation is and discover his difficulty or difficulties in it. Lead him to discover and therefore have the problem and to see the effects on him if the problem is not solved.
   b. When the problem is isolated and identified, proceed as in item 3 above. The decisions should be made by the student.

The teacher's role here is that of teacher: getting the student to be aware of the situation, discover problems, analyze them, understand, observe, evaluate, weigh, bring science or other information to bear on the problem, and finally, reach his own decision and believe it.

Some Devices Helpful in Supervision. Successful teachers generally use a number of devices which they find helpful in supervising the farming programs of their students. Three devices used by many teachers are here briefly described.

Visitation Record. A rather thorough knowledge of each student's farming program and its present status and a record

of what is done on each supervisory visit are essential. Relying on memory is a poor makeshift. If a boy or young man should keep records on his farming program, so should the teacher keep records on his supervision of it. How complete and elaborate the teacher's records should be for purposes of supervision is perhaps a matter of opinion. Unless the teacher has a more complete form to use and a plan that works better for him, this one is suggested:

In a loose-leaf notebook binder, have a sheet for each student, involving the ideas contained in the illustration on page 226. Before his first farming program is completed, the student and teacher are thinking of two programs—the program the student is finishing, and the new program he is planning or starting. So the teacher needs to have information on each of these two programs—its status as to project planning, completions, and the like. He also needs information on the supplementary farm practices of the student. Then he needs space on the visitation sheet for keeping a record on each visit to the student—date of visit, things done while there, etc.

Calendar of Farm Jobs or Practices. The teacher must always be a little in advance of the students in thinking of the things to be done in farming. He should be able to see further ahead than the students, anticipate their needs and difficulties, and be ready to give the necessary guidance and assistance in meeting them. With the vast number of farm jobs to be done and practices to be carried out, the best time for doing some of them is likely to arrive and perhaps pass without the teacher's realizing it. A calendar of farm jobs and practices can be of much help in reminding the teacher when certain things are to be done.

The calendar can be prepared by enterprises and farm subjects, ruling off a column for each month to list the things to be done at that time; that is, a column for January, a column

SUPERVISION RECORD OF FARMING PROGRAM

Boy's name.............................. Age...... Classification......

Parent's name.......................... Address....................

Farming Programs

Old program			Proposed program		
Projects (Place X before improvement projects)	Scope	Summarized (Check)	Projects (Place X before improvement projects)	Scope	Plan, first 14 points written (Check)

Supplementary farm practices this year:

Possible additions or changes in proposed program:

Record of Supervisory Visits

Date	Purpose of visit and conditions found	Recommendations made

for February, and so on, as shown in the accompanying illustration of a few things to be done in Burley tobacco. A fairly heavy solid line under the job or practice can be used to indicate approximately the best time to do it, if there is a best time. For example, the best time might be during a whole month or it might be the first third of the month. A broken line may precede or follow the solid line to show any earlier or later acceptable time for the job or practice. The time for

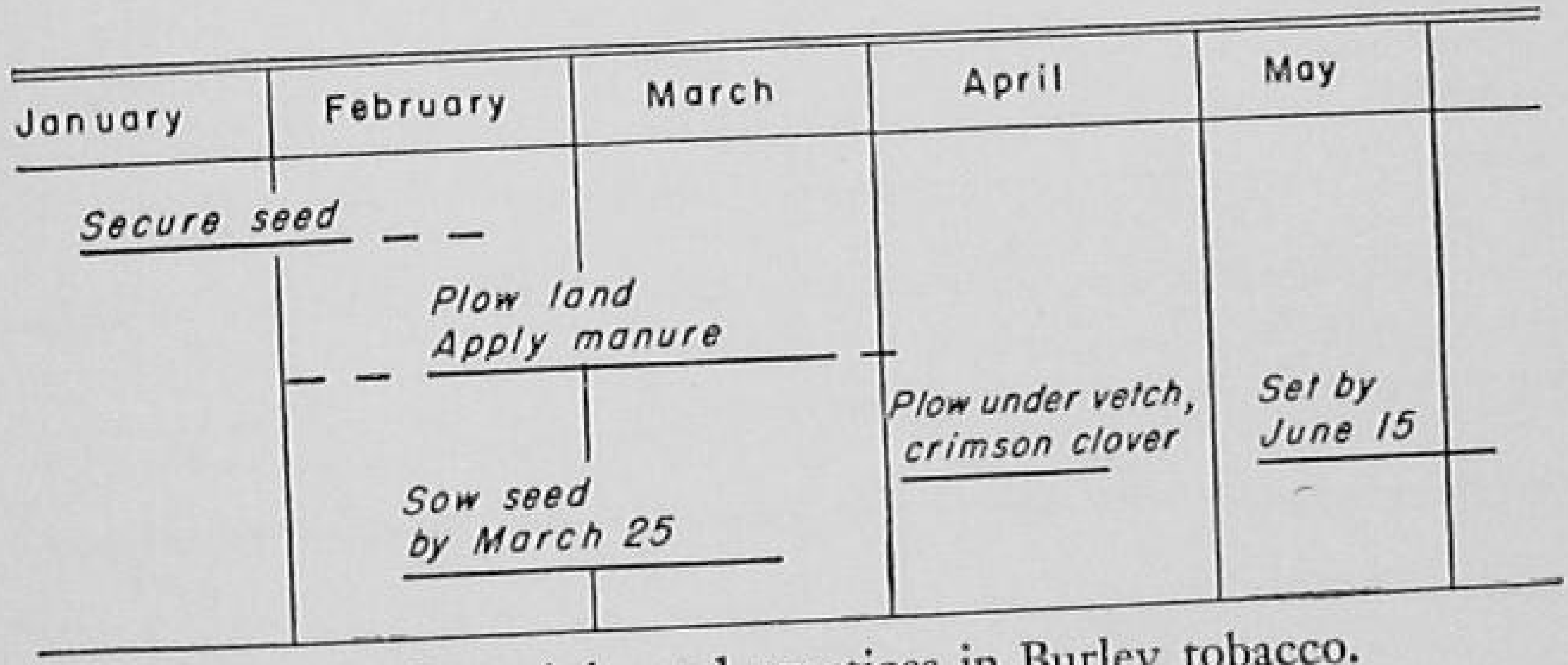

FIG. 6. Some jobs and practices in Burley tobacco.

doing a thing may extend over more than one month, of course. It is a simple matter to look down a column–April, for example–and see what things should be done in that month.

Community Map. A community map, showing where each student lives, aids in planning the supervisory visits. Mileage and time should be conserved. The teacher can usually visit more than one student on a trip. A map showing the location of each student–high-school students, young farmers, adult farmers–can save many a mile and many an hour. It can also prevent the neglect of certain students. Such a map, with snapshots of aspects of farming programs "keyed in," also makes an interesting and motivating display.

Supervising All Persons Taught. All persons who take courses in vocational agriculture are supposed to be visited on the farm–boys, young farmers, adult farmers, and any others.

Much that is said in this chapter applies in supervising any of these persons through visitation. Chapters 10 and 11, on teaching young farmers and teaching adult farmers, further discuss the supervised practice for members of these two groups.

CHAPTER 9

FUTURE FARMERS OF AMERICA, NEW FARMERS OF AMERICA, AND 4-H CLUBS

Three youth organizations—Future Farmers of America, New Farmers of America, and 4-H clubs—have a significant relationship to the teaching of agriculture, which is explained in this chapter. The first two of these organizations are connected with vocational agriculture in the public schools, and the third is connected with the Agricultural Extension Service.

Future Farmers of America

Future Farmers of America, or F.F.A. as it is commonly known, is the national organization of boys and young men regularly enrolled in vocational agriculture in the public high schools under the provisions of the vocational education acts. The organization came into existence in 1928, eleven years after the organic vocational education act (Smith-Hughes Act) was passed. The average age of active F.F.A. members is approximately 17 years; 25 years is the maximum age for active members, retention of active membership being permitted up to this age for those who have been out of high school less than three years. There is no age limit for associate, collegiate, or honorary membership.

F.F.A. is an integral part of the program of vocational education in agriculture. It serves to motivate, vitalize, and "round out" or supplement the systematic instruction in agriculture. Included in the things F.F.A. members learn, through par-

ticipation, are the parliamentary procedure necessary to conduct and take part in a public meeting; to speak in public; to buy and sell, finance themselves, and otherwise work cooperatively; to assume civic responsibility; and to provide organized recreation for themselves and others in the community. The foundation upon which the organization is built includes leadership and character development, sportsmanship, cooperation, service, thrift, scholarship, improved agriculture, organized recreation, citizenship, and patriotism.

The organization is truly democratic. Each member has a voice in formulating the policies, rules, and regulations by which he is governed. The F.F.A. is self-supporting. It operates nationally on dues of 10 cents a year per member. There are usually state dues to finance the state association, and local dues to finance the local chapter activities. The chapter often has an income from its various fund-raising activities. Membership in the F.F.A. is entirely voluntary.

Although the organization is a boy organization and has its boy officers—local, state, and national—it operates through adult guidance and counsel. There are an adult national board of trustees, national advisory council, national adviser, executive secretary, and treasurer. State supervisors of agricultural education serve as state advisers. Other adult officers of the state association usually include a state advisory council and an executive secretary or executive adviser. Teachers of vocational agriculture serve as local chapter advisers.

Development. Before the organization of F.F.A. in 1928, local departments of vocational agriculture in many states had developed agricultural clubs known by various names, some of the clubs having the words "Young Farmers" or "Future Farmers" in their names. Naturally, many of the clubs were largely social or recreational in nature, but many of them also included other features. The idea of banding together local groups of students into a larger organization

was conceived, and grew. And so the demand for state-wide organization of local groups developed. Between 1923 and 1928 a dozen or more state organizations were formed. By 1928 the country was ready for a national organization. The first national convention was held in November, 1928. Since that time the growth of the F.F.A. has been steady and rapid. There are now chapters in nearly all departments of vocational agriculture, and in every state.

Organization. The national unit of the F.F.A. is known as the national *organization*. It is composed of state *associations* (including Hawaii and Puerto Rico). Each state association is composed of local *chapters*. These terms should always be used. The local unit, for example, should be referred to as a chapter, not as a club or something else. In addition to the local chapters in the high school, collegiate chapters, which are designed primarily for men in training to become teachers of vocational agriculture, may also be organized under the jurisdiction of the state associations.

Degrees of Membership. There are four degrees of active membership—Green Hand, Chapter Farmer, State Farmer, and American Farmer. These degrees are made possible by accomplishment in vocational agriculture. Local chapters determine the boy's advancement in the first two degrees, the state association determines the third, and the national organization confers the fourth degree. Minimum qualifications are set up for the election to each degree. These are stated in specific terms in the Official Manual for Future Farmers of America.

In addition to active membership, there are three other kinds of membership: associate membership, which automatically follows active-membership status; collegiate membership, in a collegiate chapter; and honorary membership, which may be conferred on persons who render outstanding

service and help to advance vocational agriculture and the F.F.A.

The F.F.A. Emblem. The national emblem of the Future Farmers of America is significant and meaningful. It is made up of five symbols: the owl, the plow, and the rising sun, within the cross section of an ear of corn, which is surmounted by the American eagle. Upon the face of the emblem appear also the words "Vocational Agriculture" and the letters "F.F.A." The owl is symbolic of wisdom and knowledge; the plow is the symbol of labor and tillage of the soil; the rising sun is emblematic of progress and the new day that will dawn when all farmers are trained and have learned to cooperate; the cross section of an ear of corn represents common agricultural interests, since corn is native to America and grown in every state; and the eagle is indicative of the national scope of the organization.

FIG. 7. (*By permission of the Future Farmers of America.*)

Aim and Purposes. The primary aim of the Future Farmers of America is the development of agricultural leadership, cooperation, and citizenship. The specific purposes, as stated in the F.F.A. manual, are:

1. To develop competent, aggressive, rural, and agricultural leadership.
2. To create and nurture a love of country life.
3. To strengthen the confidence of farm boys and young men in themselves and their work.
4. To create more interest in the intelligent choice of farming occupations.
5. To encourage members in the development of individual farming programs and establishment in farming.

6. To encourage members to improve the farm home and its surroundings.
7. To participate in worthy undertakings for the improvement of agriculture.
8. To develop character, train for useful citizenship, and foster patriotism.
9. To participate in cooperative effort.
10. To encourage and practice thrift.
11. To encourage improvement in scholarship.
12. To provide and encourage the development of organized rural recreational activities.

Activities. The aim and purposes of F.F.A. are attained through a program of activities (or program of work). Programs of activities are set up annually by each chapter, each state association, and the national organization. There is, or should be, a relationship among local, state, and national programs. The F.F.A. was, and is, designed to *supplement* the training opportunities for boys and young men taking vocational agriculture. Its activities are not the regular activities in vocational agriculture.

An F.F.A. activity is a group activity, carried out by the chapter as a group of boys and young men, by the state association as a group of chapters, or by the national organization as a group of state associations. Obviously, an appropriate activity for one of these three units is not an appropriate activity for the others. One unit cannot perform the work of another unit.

Since the teacher of agriculture is concerned first with *chapter* activities, let us make clearer, if we can, what a chapter activity is. A chapter activity is a *group* activity that gets its sanction from the aims and purposes of F.F.A. It should contribute to the attainment of the aim through accomplishing one or more of the specific purposes. Take, for example, this activity: Conduct two project-visiting tours. With the

scope of the visiting and the ways and means decided on, this would constitute an appropriate chapter activity. It would be engaged in by the chapter as a group. It could very well encourage members in the development of their farming programs, would call for cooperative effort, and offers an opportunity to accomplish still other purposes. Take, on the other hand, these five "activities": each boy have a livestock project, use improved farming methods, publish an F.F.A. state newsletter, one hundred per cent membership in F.F.A. of boys enrolled in vocational agriculture, provide shop courses for farmers. None of these is a chapter activity. Each boy's having a livestock project is purely an individual affair, as is using improved farming methods; these are not the work of a chapter. Publishing a state F.F.A. newsletter might be an activity of a state association, but it is not a chapter activity. One hundred per cent membership in F.F.A. is a goal, not an activity. Nor does the F.F.A. hire teachers, set up courses, or furnish shop buildings.

Chapter activities should be clearly stated as activities. "Sheep improvement" is not a good statement of an activity; it is not specific enough, the expression is too inclusive, too general. "Encourage the use of protein supplements" is equally objectionable as a statement of an activity. What activity or activities the chapter will engage in to encourage the use of protein supplements is not at all clear.

As suggested in the F.F.A. manual, goals should be set up and likewise the ways and means of carrying out the activity should be indicated in the program of activities. These two things, when done, help make plain what activities are to be engaged in. Also, since they are specific, they make it possible to check on the chapter accomplishments.

Unless the activities listed are the activities that the chapter desires and intends to carry out, there really is no program of

activities. Without a program of activities, the chapter cannot justify its existence, since the purposes of F.F.A. are to be accomplished through its activities. It should not be overlooked that F.F.A. activities are part of the work of the school, so they should be approved by school authorities.

Teacher Responsibilities. The teacher of agriculture is responsible for the success of the F.F.A. in his department, just as he is responsible for the success of other undertakings in it. Without attempting to make a complete list of his duties or responsibilities in this connection, here are some of them:

1. Believe in F.F.A. as an integral part of vocational agriculture. The teacher is not likely to be a good chapter adviser if he does not believe in Future Farmer work.

2. Become familiar with F.F.A.—what it is and does, its purposes, etc. One cannot very well hope to succeed with something he knows little about, nor is he likely to be interested in it.

3. Assume the initiative for getting an F.F.A. chapter established in the school if there is not one already. The teacher would not expect the boys to take the initiative in having good farming programs or in building up a good agricultural library in the department. He should not expect them to take the initiative in establishing an F.F.A. chapter.

4. Assist the boys in securing a good set of officers. The officers have much to do with the success of the chapter. Boys should know the duties of the officers and the qualities and characteristics necessary for success in each office, before they elect the officers. After the officers have been elected, they should be further trained and developed. Leadership here is the definite responsibility of the teacher.

5. Guide members in setting up a good program of activities, and in financing and carrying it out. The teacher should see that the chapter has a good program before it is approved

and adopted by the chapter. The program of activities is the heart, soul, and center of F.F.A. work. Without a good activity program, carried out, success in F.F.A. work is not possible. The activity program is the teacher's grand opportunity. Teaching is directing the activities of learners so as to result in their learning. Here is an organization that does its work through an activity program. An enterprising teacher takes advantage of the possibilities.

6. See that chapter meetings are held regularly throughout the year and conducted properly. The chapter that does not hold meetings is not a live chapter. Meetings are necessary to interest in the chapter, and what is done at the meetings is an index of the interest. Chapter meetings should not "die down" during the summer.

7. Keep school authorities and the public in touch with F.F.A. activities and developments. *Information* and *participation* are the keys to securing interest in an undertaking. See that school authorities and community leaders are informed and, where possible, get them to take part in doing something for or connected with the F.F.A.

8. See that boys and their parents know the meaning and significance of advanced degrees and know the qualifications for receiving them; also check the qualifications of members. Often a boy fails to make an advanced degree because he does not know or his parents do not know about the degree or the qualifications for it soon enough.

9. Help set up a system of adequate records and accounts. Such records are necessary to attaining the purposes of F.F.A. In many instances they prevent an unfavorable reputation for the chapter.

10. Guide the chapter to have a good library of materials pertaining to the F.F.A. and its purposes. Members need a source of information.

11. Guide the members in making use of any cooperatives they have formed. Often boys and young men fail to use a cooperative because they do not know of the services it renders or because making use of it just does not occur to them. The teacher has many classroom teaching opportunities and many opportunities when he is supervising the farming programs to guide the boys in making use of their cooperatives.

Ways and means of discharging most of these responsibilities are suggested in the F.F.A. manual.

Helps for Teachers. In addition to the several books on phases of F.F.A. work and the good but inexpensive publications on parliamentary procedure, the approximately hundred-page official F.F.A. manual is full of information and helps for the teacher. Most states issue a handbook, under various names, that contains the state association program of activities and many other kinds of information helpful to teachers in these states.

New Farmers of America

New Farmers of America, or N.F.A., is an organization for Negro boys and young men studying agriculture in the sixteen states where separate schools are maintained for Negroes. It is similar to the Future Farmers of America, and became an organization in 1935. As was true with the F.F.A., there were state associations for several years before a national organization was formed, the New Farmers of Virginia holding a state meeting in 1927.

Nearly all the statements made under Future Farmers apply equally well to New Farmers. The twelve purposes of the two organizations, as stated in their national constitutions, are almost identical.

The N.F.A. Emblem. The national emblem of the New Farmers of America is made up of five symbols: the plow, representing tillage of the soil; the owl, representing wisdom; the rising sun, representing progress; an open boll of cotton with two leaves at its base, representing important agricultural interests of many members; and an American eagle, representing the wide scope of the organization. The emblem also carries the three letters "N.F.A." and the words "Vocational Agriculture."

FIG. 8. *(By permission of the New Farmers of America.)*

Degrees of Membership. The four degrees of membership are Farm Hands, Improved Farmers, Modern Farmers, and Superior Farmers. The degrees are contingent upon accomplishment in vocational agriculture.

4-H CLUBS

By act of Congress (Smith-Lever Act), youth training in agriculture through 4-H clubs as an activity of the Extension Service, is placed under the U.S. Department of Agriculture, agricultural extension in the land-grant colleges, and the county agricultural agents. (Development and work of the Extension Service are discussed in Chap. 14.) Originally, the objective of 4-H club work in agriculture was solely to teach agricultural practices in a few restricted enterprises—corn growing principally. The work now includes projects in nearly all phases of agriculture. More ideals have been introduced as objectives, including leadership, culture, cooperative endeavor, social and recreational opportunities, and the like. In 1948 there were in the United States 80,246 community 4-H clubs for boys and girls, including the homemaking

clubs, and 203,211 volunteer men and women served without pay as local club leaders. The total membership was 1,760,000, about 40 per cent of whom were boys and 60 per cent girls. Any rural boy or girl between the ages of 10 and 21 (slightly different ages in some states) may enroll with the county agent.

What 4-H Club Work Is. As already stated, 4-H club work is part of the Extension Service. It is the largest organization of rural young people in the world. The four "H's" in the name stand for head, hands, heart, and health. The well-known symbol is a four-leaf clover, with a "H" on each leaf. When a boy or girl joins a club, he takes this pledge:

> I pledge
> My *head* to clear thinking
> My *heart* to greater loyalty
> My *hands* to larger service, and
> My *health* to better living,
> For my club, my community, and my country.

When a person joins a club, he chooses one or more projects to be done at home as a part of his training job. Young club members usually have only one project a year. As an agricultural project a boy—or a girl—may raise a field crop, a garden, or start with a calf, pig, lamb, or flock of poultry, or go in for soil conservation, wildlife practice, etc. The average scope of individual projects in Kentucky for 1947 was: home garden, 0.26 acre; corn, 1.3 acres; dairy cattle, 1 head; beef cattle, 1.2 head; hogs, 1.4 head; sheep, 8.6 head.

Requirements for clubs are as follows:

1. Each club must have at least five members (ten members in many states).
2. It must have an adult leader.

3. It must have the necessary officers.
4. It must have a planned program for the year.
5. It must hold at least six regular meetings during the year.

When the club has met the first four of these requirements, it may be issued a charter. Club groups are organized early in each calendar year.

The adult leader required for each agriculture group is usually a local farmer. The qualifications are ability to work with young people and command their respect, and a fair knowledge of the subjects involved in the projects represented. Leaders of a county are brought together two to four times a year to receive information about organizing and supervising clubs, as well as to receive subject-matter training. The specific duties of a leader are to

1. Assist in securing members.
2. Attend meetings of the club.
3. Complete organization and see that officers are instructed in their duties.
4. Assist the club in making its program for the year.
5. Furnish information to members about their projects.
6. Visit members at home whenever possible.
7. See that members keep up with the requirements for their projects.
8. Assist in arranging for tours, picnics, exhibits, and rally and achievement days.
9. Attend leaders' training schools.
10. Make a report of the club's work to the county agent.

Place in Educational Program. There is no question as to the soundness of 4-H club work as an extension activity. Its value as a means of teaching has been demonstrated. Club work should be developed to its utmost because of its important

place in supplementing the work of the school in the education of rural boys and girls. The chief educational aims and values of 4-H clubs in agriculture are those that deal with:

1. The development of ideals, interest, and favorable attitudes toward farming and rural life
2. An appreciation of wholesome living
3. Providing experience that will serve as a basis for a vocational choice
4. Elementary proficiency in farming occupations

The club program stimulates its members to further educational work. Those who expect to follow an agricultural occupation should receive advanced vocational training in agriculture provided by the high school and be in a better position to profit from the adult program in agricultural extension. Many of the attitudes, leadership qualities, and viewpoints of club members will affect their continued education.

CHAPTER 10

TEACHING YOUNG-FARMER COURSES

Education for *all* people should be the goal of the secondary-school program. The national acts in vocational education provide for systematic instruction in agriculture of less than college level for young men not in school and for adult farmers, as well as for boys in school. The young-farmer program provides instruction on a part-time basis for young men approximately 16 to 25 years old who are establishing themselves in farming occupations, after they graduate from high school or drop out of school. They may or may not have had previous instruction in vocational agriculture. These young men are an in-between group, between the high-school-boy group on the one hand, and the adult-farmer group on the other. They are in between in age, farm experience, reading and study habits, achievement of independence, and establishment in farming. They are becoming established in farming, but have not reached the stage of full establishment.

Departments of vocational agriculture should provide the needed instruction for those who *have* entered and those who are *preparing to* enter the work of the farm. It is significant that in the first vocational education act (Smith-Hughes Act), the clause "who have entered upon" precedes "or who are preparing to enter upon." The future of farming and farm life depends, to no small extent, on an adequate program of instruction for young farmers and for adult farmers. An adult-farmer class is designed for adults; a young-farmer class is designed for young farmers.

Need for Young-farmer Work. Because of the criticalness of this period in the preparation of young men for farming, the young-farmer program is, in many ways, the most important part of the total program of vocational education in agriculture. It is doubtful if any school can justify offering vocational agriculture for high-school boys where there is not a need for young-farmer work in agriculture. If farming interest terminates with the boys, high-school vocational agriculture cannot be justified, the word "vocational" becomes a misnomer. No program of vocational agriculture is complete or adequate unless it provides young-farmer courses.

Apparently, in normal times at least, there are enough young men for a young-farmer course in any community that ought to have vocational agriculture in the high school. Many communities have been surveyed. In nearly all of them more out-of-school young men over 16 years old on farms have been found than high-school boys enrolled in vocational agriculture. It is not unusual to find 100 of these young men in a community where only 30 to 40 high-school boys are taking vocational agriculture. Census data bear out the findings from surveys. Just before the war there were 1,300,000 young men on farms between the ages of 14 and 25 who were out of school and not established as farmers. Since number itself does not prove need, we must delve further into the need for young-farmer work.

The objectives in vocational education in agriculture cannot be attained without working with young farmers. One of the major objectives of vocational agriculture is *to develop effective ability to make a beginning and advance in farming*. The contributory objectives necessary to the attainment of this major objective (as outlined by a national committee on objectives and published by the U.S. Office of Education) may include effective ability to

1. Evaluate resources for farming.
2. Analyze opportunities for farming at home and on other farms.
3. Locate advantageously for farming.
4. Arrange for initial participation in farming.
5. Procure suitable land for farm operations.
6. Obtain supplies for farm operations.
7. Procure necessary farm equipment.
8. Procure and maintain livestock.
9. Obtain needed capital on a sound financial basis.
10. Increase size of farming business.
11. Purchase farm lands advantageously.
12. Set up a long-time farming program.
13. Formulate and attain specific advancement goals at definite periods of time.
14. Formulate and carry out a self-improvement program.

Notice how many of these contributory objectives will not be attained, or will be only partially attained, where teachers do not have a young-farmer program. There are several different levels of being engaged in farming. The statement of the major objective which we are examining implies the fact of *progressive* advancement from one level in farming to another level. Such advancement calls for intelligent analysis and guidance at each level.

To start farming and make *continuous* progress in farming until one becomes a full-fledged farmer calls for a number of abilities the development of which requires several years beyond the high-school period. This is because of lack of maturation at the younger age, lack of vocational opportunity, and lack of time during the high-school years when the student must and should get a general education. It is not possible during the high-school period to give all the training necessary for proficiency and establishment in farming. Re-

gardless of how effective and successful the instruction for high-school boys may be, even those with four years of vocational agriculture need additional instruction and supervision before they are ready to take over a farm and operate it.

Young farmers are continually faced with new problems as they become established in farming. During the period just before they begin farming on their own, many problems confront them which have a definite influence on their future. During this period, systematic instruction will probably be more fruitful than at any other period in their lives.

Young men have more time for education than older farmers. They have study habits and reading habits carried over from their recent schooling. Many of them are eager to learn because they *must* learn. They are generally neglected by other agencies and are in a state of readiness for an adult leader. They enjoy the social contacts a young-farmer class may provide.

There can be no question as to the capability of young farmers to profit from instruction. Nothing is "wrong with them." Many of them have completed high school, and some have gone beyond. Many others are of the same age and capabilities as college students. Some recent studies seem to indicate that the college is no longer a select group of students, that college students rank little if any above the general population in intelligence. In so far as age is concerned, men in their early twenties are approaching their highest learning ability, as may be seen in the graph on page 46.

The farmer-training program should begin in the high school and continue, without a break, through the young-farmer period into the adult-farmer period. Adult-farmer work is designed for adults who are already established in farming, and not to meet the needs of young men 16 to 25 years old. Young-farmer work is needed to provide a connecting link between high-school and adult instruction. It is

needed in order to make vocational agriculture a continuous program. Education is a continuous process. A school cannot afford to have vocational agriculture with high-school boys, then neglect them for six to eight years, hoping to pick them up again as adult farmers after they have met their most crucial problems without the school's help and guidance. The future attitude of young farmers toward adult education and toward the school will largely depend on how their educational needs as young farmers are met.

The school needs the young-farmer work, just as young farmers need the school. Teaching young farmers improves the teachers and their teaching of high-school groups. It helps acquaint teachers with what lies beyond the high-school years and enables them to determine more intelligently their teaching objectives with the boys. Likewise, an adequate young-farmer program lessens the pressure for the amount of work to be done in agriculture during the high-school period. Young-farmer work also extends the influence and scope of the school program in the community. Through application and through continued use, it prevents the loss of much learning that has been acquired in school and thereby the loss of much of the previous investment in education. The lag in the thinking of school people, which accepts the idea that high-school work ends all unless one goes to college, must be overcome.

Dr. H. M. Hamlin of the University of Illinois has suggested that the relatively small expense per student for young-farmer work might be warranted as "insurance" against the development of criminal and antisocial tendencies, since it is well known that this age group furnishes most of the criminals and delinquents.

However, as Dr. Hamlin implies in other statements, expenditure for young-farmer work should be encouraged on the grounds of simple justice. The public furnishes compara-

tively large sums for the college education of persons of this age who leave their home communities. Those who remain at home also have a right to a continued education. They contribute, through their labor, to the taxes which maintain the students in college and often receive nothing directly themselves.

Characteristics of Young Men on Farms. Teachers should know the chief characteristics of this "in-between group," particularly how young men are different from high-school boys and from adult farmers. These differences must be taken into consideration in deciding on the techniques and procedures to use in teaching and in meeting generally the needs of young men through young-farmer work.

Compared with high-school boys, young farmers are

1. Somewhat older. Thus they are more experienced in farming, and are further along toward establishment in farming and toward having families of their own. They are more responsible for their own acts.
2. More widely varying as a group in age, schooling, and ability. Within a high-school class most of the boys are usually very near the same age and have nearly the same amount of schooling.
3. Less willing to do routine schoolwork without questioning it. Class attendance by young farmers is voluntary; they are not even subject to the pressure of public opinion. The course work must seem worth while to them.
4. More critical of the kind and amount of reading to be done in the course. They expect the reading to be specifically helpful in solving their problems.
5. More able to carry out a good-sized farming program. High-school boys must spend most of their time in

school and therefore they have less time for a farming program.

6. More certain to farm. Being older than boys, more of the young men have made a vocational choice. Also, they do not take a young-farmer course unless they are interested in farming. The young men are a more select group, vocationally speaking.
7. More interested in the strictly vocational aspects of agriculture. Since they are entering upon farming or are closer to entering, they have a more vital interest in those things which directly affect vocational success.
8. Less well supplied with organized social and recreational opportunities. The school makes possible clubs, societies, athletics, and the like for the high-school boy.

Compared with adult farmers, young farmers are

1. Younger. They are thus less experienced in farming and less well established in farming; they have had much less managerial experience. Adults are farm operators. Six to eight years usually elapse between the high-school period and establishment as a farm operator.
2. More capable of reading, more willing to read and study, and in other ways follow a school "pattern." Most young farmers are not long out of school. Also, their eyes are better than the eyes of adult farmers (see page 271). Four-fifths of the veterans enrolled for institutional on-farm training have completed the eighth grade or more.
3. More capable of forming ideals. In not so many instances have their ideals forsaken them.
4. Less free to carry out improved practices in farming.

Adult farmers are usually free to do what they wish without obtaining permission from anyone.

5. Perhaps more willing to use improved farm practices. Young farmers in their outlook are more willing to take a chance on "something that looks good."
6. Somewhat less sure to farm. Adult farmers are already farming on an independent basis.
7. More in need of occupational guidance. Young farmers are greatly in need of guidance because it is during this age that most of them select their vocation.
8. More interested in social, recreational, and related activities. Young farmers are still young and therefore have the characteristics of young people.
9. Less well supplied with wholesome organizations to belong to or work through. Adults have their lodges, farm organizations, and the like.
10. Less influential in community affairs. Adults "run things." They own the property, pay the taxes, possess the culture of the community, have the "say-so" in general.

Objectives of Young-farmer Work. The chief reason for having young-farmer work is to be of service to young men who are becoming established in farming. Young men have much to learn and they need guidance. They should have sympathetic, capable teachers. Not all the young men in a farming community will become farmers. Young-farmer work is for those who have decided to make agriculture their vocation and whose interests, capacities, and personal qualities are such as to ensure their success and happiness in it.

The young man to be satisfactorily and progressively established in farming needs a rather large number of effective abilities. Also, he must have certain tangible things to

farm with. If he is to farm, he must farm somewhere; he must have tools and machinery, and power; and he must have some operating capital. Service to young men in becoming established in farming can be divided into two categories—teaching or developing the effective abilities needed, and other service.

Teaching Objectives. As always in teaching, the abilities that should be developed depend in part on the abilities that have already been developed through previous training and experience. Many of the abilities needed by young farmers are already possessed by those who have had vocational agriculture in high school. Other abilities have been partially developed by schooling or farm experience, but need further development. Still other abilities will have to be developed from almost the starting point. The latter group is the larger for most young men who have not had vocational agriculture in high school.

It is not possible to list here the specific teaching objectives that any particular teacher should attain. The objectives that follow are, of necessity, quite general and inclusive. Specific objectives will need to be worked out for each course.

Objective: To develop the effective ability to

1. Produce farm products of quality and at the same time maintain or increase the productivity of the soil.
2. Plan and manage a farming program in keeping with one's farming status, modify the factors of production to meet varying situations, and unify the enterprises into an economically efficient program.
3. Market the farm products to advantage, and buy the materials and implements necessary to operate the farming program.
4. Plan for, select, and maintain in good condition the physical equipment and power of the farm.

5. Secure and wisely use the capital needed for the operation and expansion of the farm business, and plan for its repayment.
6. Cooperate with one's fellows in mutually helpful activities that expedite the solution of their common farm problems.
7. Participate in founding and maintaining an attractive and happy farm home.
8. Appreciate the inherent beauty and worth of the many objects, institutions, and activities of the rural environment, to the end that they will be a never-ending source of enjoyment.
9. Have a justifiable occupational pride in farming.
10. Participate in the civic institutions and movements whose program affects the young farmer's economic welfare.
11. Plan for oneself a program of placement and progressive establishment in farming and continue the study of agriculture and rural living.
12. Make a good and equitable rental or trade agreement.
13. Interpret and execute properly the legal papers that safeguard one's economic interests in becoming established in farming.
14. Keep, interpret, and use farm records on a young man's farming business.
15. Be socially proficient (which includes the use of etiquette).

Other Objectives. Although young-farmer work is largely systematic instruction, with its classwork and supervision of the farming programs, there are other things to be done by the teacher. The teacher should be a counselor, adviser, and friend to these young men; they need a man who is trained in

agriculture. Some of the teacher's objectives with the young farmers that extend beyond teaching may well be to

1. Guide them in discovering their aptitude for farming and other occupations, and in making a final choice of a vocation.
2. Help them to determine their present opportunity for becoming satisfactorily established in farming.
3. Assist them in finding opportunities for becoming established, or better established, in farming.
4. Assist them in selecting, planning, and having good long-time farming programs.
5. Help them secure equitable and sound rental or trade agreements.
6. Assist them in making sound financial arrangements.
7. Assist them in investing their incomes wisely.
8. Formulate and attain specific advancement goals at definite periods of time.
9. Assist them in procuring the things to farm with.
10. Give them an identity, make them feel that they are somebody.

Concept and General Plan. As may be seen from the possible objectives just listed, a good young-farmer program requires considerable effort and time; it cannot be put over by devoting to it only a few spare hours. It is an important part of the total program of vocational agriculture, and should be a systematic program extending over a period of years. In most communities it can be built upon high-school vocational agriculture, through which most of the young men will have come. At least a three- or four-year course sequence should be planned. Twenty to thirty class meetings during the fall and winter (slack season) should be held usually, with monthly meetings the remainder of the year to deal with cur-

rent farming plans and problems and to hold the group together. The slack-season meetings should be held no less frequently than once a week. A program which requires considerable time of teacher and students is likely to be more vital and challenging to all those connected with it than a program which takes but little time and yields correspondingly little for their efforts.

Young-farmer work is by no means limited to classwork. A large part of the training of young farmers is done through their farming programs. Each young man has a farming program and receives the help and guidance of the agriculture teacher in planning and carrying it out. Much of the classwork is related to the farming programs of the students.

If the school is to have the educational program it should have for the young people of the community not enrolled in the regular school, it will have a well-rounded program rather than merely a program of education in agriculture. This will require time of several teachers.

Securing Facts on Need in the Community. School officials may have to be convinced, and even teachers sometimes, that there are enough interested out-of-school young men on farms in the community to justify a young-farmer course or courses. Whether this is the case or not, a survey usually should be made, preliminary to the planning and promotion of the work in communities where it is not already well established. The survey for this purpose is a simple general survey, to gather a few facts on all the young men on farms and not in school, between the ages of 16 and 25. The more detailed surveys on farm practices and the like are for other purposes, and may be made later.

Just what items should be on the form used in making this general survey may be a matter of opinion. Perhaps these items should be included:

Name of young man...

Age......... Community or address..

Name of parents or guardian...

Home farm: Size........... Type........... Owned or rented...........

Present farming status of young man...

His ownership in farming:

Acres of land owned...............

Livestock........................

Tools and machinery...............

Buildings........................

Crops grown this year, kind and acres..................................

Highest grade completed in school......... Where?......... When?........

Years of vocational agriculture in high school..............................

Number of older brothers on home farm......... Younger brothers.........

The survey form, of course, is mimeographed or duplicated in some other manner, with the items spaced for easy recording and tabulating.

It is always wise in making a survey, to find any data on the subject that have already been collected and to contact any sources of information that might be helpful. The survey can then be made more intelligently. Contacting such sources of information may save a great deal of work in making the survey and may result in a better survey. In many states the office of the county superintendent of schools has the names and ages of young men, by school districts or other divisions, brought up to date by the school census each year. Checking the current school-census list against in-school lists will reveal most of the young men of school age not in school. A previous school census—say five to seven years back—will supply names of young men who are now beyond school age. Usually it is not difficult to find out whether these young men

are still in the community and on farms. If they are on farms, their names can be put on the list to be surveyed.

Present high-school boys usually know many of the young men in the school area, and a great deal about their farming status. They can render much service in making a good survey.

Not to be overlooked are the class records and files, for several years past, of the boys who have taken high-school vocational agriculture. These former students on farms in the community who are not yet adult farmers should be given first consideration for young-farmer work.

After the survey is made and the prospects for young-farmer enrollment determined, a map of the community should be filled in showing the location of each prospect.

Planning the Young-farmer Program. If the school authorities, the teacher or teachers of agriculture, and perhaps an advisory committee believe that there is need for a young-farmer program, the agriculture department can then begin to specifically plan it. Of course, school authorities must approve the program before it can be put into operation. It is the duty of the agriculture teacher to inform and instruct school officials on what young-farmer work is, the need for it, and any other things about it they do not understand. If the teacher is to "sell" them the idea, he should have a workable plan to present.

Agriculture is usually taught by regular teachers of vocational agriculture. It is good for the teachers of high-school boys to be teachers of young farmers also. Where special teachers are employed, they should be staff members in the department of vocational agriculture. The young-farmer program should not be a separate program. It should be part of the work of the agriculture department, which is a part of the school.

Classes may need to be organized for more than one group of young farmers. There may be justification for a younger group and an older group, or for groups by types of farming,

or, in some instances, for groups in different outlying communities. Some teachers have a separate class for young men who have not had vocational agriculture in high school.

In most communities the class sessions are in the evenings. However, they may be in the daytime if this is more convenient for the students and teacher. The class sessions are usually held at the high school, preferably in an agriculture classroom, though they may be held at any other place that has good facilities for instruction. Length of meetings should perhaps be from 1½ to 2 hours, less time than this being too short to justify coming together or to do effective teaching. The time and place of meetings must be checked with the school authorities; the work must fit into the total school program.

Enrollment will need to be recruited, particularly where young-farmer work is new. If young-farmer work is well established in the community, almost no recruiting may be necessary. Then, in some instances, the young men "recruit the teacher." Perhaps the soundest program of recruiting young farmers is to find out who the young men are who can profit most from the instruction, and recruit them individually. Boys should be graduated from high school into young-farmer work; this should be a planned part of recruitment. Usually the teacher will need to do a good deal of personal visiting. To supplement the personal teacher visits, these devices and agencies may help in recruiting young men who have been identified by the teacher:

Telephone calls
Personal letters and cards
The school principal or superintendent
Other teachers in the school
Rural bankers
Rural pastors

Adult-farmer school members
Present and former young-farmer school members
Members of advisory council
Members of local board of education
The county agent
Soil conservation personnel
Officers in farmer organizations
Local F.F.A. or N.F.A. chapter members

The young farmers themselves should be in on planning their program. Where young-farmer work is well established, they can do most of the recruiting. Even when starting young-farmer work, the young men should decide when they would like to meet and possibly where, frequency of the meetings, and such things, under the guidance of the teacher. It is well, at an organization meeting, if the group elects a president, secretary, treasurer, and any other officers needed. The young men should be encouraged to run their organization, with proper teacher guidance.

The Course of Study. As stated under Concept and General Plan, there should be at least a three- or four-year course sequence, with continuous instruction throughout the year. Too much emphasis cannot be placed on the importance of carefully worked-out courses. If a young-farmer course is to be taught, there must be a *course* (see page 63). A young-farmer course is not just a number of meetings on a variety of enterprises and problems. Because of the relatively few meetings, it is very important that there be a well-organized course so that the best possible use may be made of the time. As attendance is voluntary, something worth while must be done at each meeting. Even animals will not continue to return to an empty feed trough. Principles of course building are discussed in Chap. 4.

Each year there should be a body of instruction that is of

importance and common concern to the young men in the class. This may or may not be a single productive enterprise. It may cut across enterprises, as would be the case if it dealt with the livestock program, or producing feed crops, or feeding farm animals. It may deal with the farm business as a whole, from any one of a number of approaches, as would be the case in using such a subject as planning the farming program. The main body of instruction might well require as many as fifteen or more class sessions. There should be plenty of opportunity for the young men to solve their individual problems, either during meetings set aside for this purpose or during a part of each meeting. The teacher should not lose sight of this principle: The main reason for bringing the young men together for instruction is their common educational needs and interests.

In addition to the fifteen or more meetings dealing with the "core of instruction," several class sessions may be devoted to selecting and planning the farming programs, and as many sessions as feasible to the supplementary and related subjects and material. The monthly meeting, held each month in which there are no meetings on the main body of instruction, can be devoted to current farming problems and practices in the farming programs of the young men.

The course of study should be set up on the basis of teaching objectives and the problems that may be used in teaching. Always the teacher must know the objects of his teaching—what learnings he shall attempt to bring about. The young-farmer course should reflect the general objectives of young-farmer work (pages 250 to 252).

Selected portions from an outline of a young-farmer course on planning the farming program follow, for the purpose of illustration. First are presented the teaching objectives, with the subdivisions or smaller objectives omitted.

OBJECTIVE: To develop the effective ability to

1. Understand the general features of a good farming program.
2. Decide on the size of farm business to have.
3. Realize the importance of good production.
4. Plan the best use of the farm land.
5. Decide on the land improvements to make.
6. Decide on the cash crops to grow.
7. Decide on the feed crops to grow.
8. Decide on the kind of livestock to have.
9. Determine the amount of livestock to keep.
10. Plan the home food supply.
11. Decide on the power and machinery to have.
12. Decide on the equipment needed.
13. Plan the fencing improvements to make.
14. Set up a financial budget for the farming program.
15. Plan for financing the farming program.
16. Set up the insurance program for the farm business.
17. Make a good rental or trade agreement.

The lesson outline to be used in attaining objective 8, showing statements of the smaller objectives, might be something like the following outline, which might apply to a Missouri, Tennessee, or Kentucky community where livestock are important.

OBJECTIVE: To develop the effective ability to decide on the kind of livestock to have.

a. See how the kind of livestock affects size of farm business.

b. See the relation of ownership of livestock to establishment in farming.

c. See how the basic feed crops affect the kind of livestock one should have.

d. Decide on the kind of livestock for a particular farming program.

Some things in the situation (to be brought out by the teacher and students during the discussions):

1. Livestock is essential to good farming on most farms in the state. It is difficult to have a good-sized farm business or efficient use of man labor on most general farms without an important livestock enterprise.
2. A large part of the land on most farms in the state should be kept in pasture and hay crops.
3. Many farms cannot have a good-sized farm business (above 400 productive man-work units) without livestock. The smaller the acreage, the more difficult it is to have a good-sized business.
4. Approximately half of the farm income should be from livestock.
5. On small farms intensive livestock will return a larger total income.
6. Livestock provides a market for pasture and roughage and other home-grown feed; also, additional employment for labor.

Problem. What main livestock enterprise or enterprises should be in our farming programs?

Things to Consider

1. Feed produced on the farm
2. Labor that can be used
3. Markets available
4. Conditions favorable or unfavorable to the various livestock enterprises

References. (List those that will be helpful in solving the problem.)

Conclusion. (The problem is to be solved by the group, and a sound conclusion arrived at and properly supported.)

Teaching Procedure. The teaching procedure with young farmers is not essentially different from good procedure used with high-school boys. Using problem solving in teaching is discussed in Chap. 5. In effective group problem solving, there must always be a good adaptation to the group, both of the problem and the manner of handling it. (See characteristics of young men on farms, page 247.) A problem to one group may not be a problem to another. Any group should contribute whatever it can to solving the problem under consideration. Young farmers, with more farm experience than high-school boys and perhaps with more schooling, can usually contribute more to solving a problem than can the boys; they can contribute more in getting the problem before the group and in arriving at a group conclusion; they can shoulder more responsibility. They can usually analyze problems in less time and with less help from the teacher, can solve them each young man for himself with less reading, and can arrive at a functioning group conclusion more directly. Thus young farmers can handle problems of larger scope than can boys. It is fortunate that this is so, because of the fewer class meetings with the young men.

Young men may be expected to vary more in all their abilities than high-school boys, chiefly because of the greater differences in age and in schooling. For a number of reasons, the teacher of young farmers finds it well to suggest reading materials that bear very directly on the problem to be solved, with no reading that is not helpful and necessary. This calls for a more rigid selection of reading matter than with boys. Time for class meetings is more limited with the young farmers, reading is not required of them, and satisfactory and recognized progress in the classwork is essential.

Planning for the teaching is as necessary with young farmers as with high-school boys, even more necessary. There are fewer meetings with the young men, and their class attend-

ance is voluntary. Accomplishment is a necessity; time must be used to the very best advantage.

As with high-school boys, there can be class problem solving with young farmers, small-group problem solving, and individual problem solving. Also, as with boys, the teacher and young farmers will not always be solving a problem; some other things are to be done.

Supervised Farming. Chapter 8 is devoted to supervising practice. Much of what is said in that chapter applies to supervising the farming of young farmers.

Members of young-farmer classes should have farming programs that will help them become established, or better established, in farming. This is the real period of establishment in farming. A start has already been made by those young men who have had vocational agriculture in high school. In addition to what they have learned about farming, they have accumulated some capital, perhaps own some livestock or equipment, and may have formed a partnership in certain enterprises. But for the most part, members of young-farmer classes are not yet farm operators. Generally speaking, farm operators should be members of adult-farmer classes. Being a "young farmer" is not wholly a matter of age. It is partly a matter of farming status.

The farming status of a young farmer affects the kind of farming program he can have or should have. The status varies all the way from farm laborer at home, to owner-operator. For the young men just out of high-school vocational agriculture, their farming programs should be continued and expanded. At first, most of these young men will have farming programs made up of productive-enterprise projects, improvement projects, and supplementary farm practices. As rapidly as they can do so, young farmers will progress toward higher levels: partnership in one or more enterprises, partnership in the farm business, renter-operator, owner-

operator. Young men who have not had vocational agriculture in high school will start their supervised farming programs at whatever level their farming status permits.

The teacher's responsibility in supervising the farming programs so that they may contribute most to establishment in farming is very great. Supervision is not limited to the going programs. Many young men who want to farm are confronted with problems of finding opportunities for farming, securing the necessary livestock and equipment, and financing their programs. Helping the young men solve these problems is a teacher responsibility. As with the high-school boys, the teacher of young farmers must help them *select* their farming programs and make arrangements for them, must help them *plan* the carrying out of the programs, and must *teach* the young farmers so that they will succeed with their programs and become more proficient in farming. The teacher's responsibilities in supervising the farming programs of young farmers are as broad and inclusive as the objectives of young-farmer work (page 249). It is through the farming programs that most of the young-farmer teaching objectives are attained. Important as supervised farming is with high-school boys, it is even more important with young farmers. The young farmer is free to devote a larger part of his time to his farming program since he does not spend so much time in school; the teacher has correspondingly less time to work with him at school. Young farmers are entitled to good supervision. A young farmer with a good farming program should perhaps be visited at least once every other month (six visits a year) in addition to the visits to give special help on special problems.

Becoming Established in Farming via the Home Farm. Since many young men become established in farming by way of the home farm, the types of activities in the following list should be considered in developing farming programs with

young farmers. (Most of these activities are suggested by Dr. George P. Deyoe in his book *Supervised Farming in Vocational Agriculture*, The Interstate.)

1. Help improve the farm business by doing such things as:
   a. Carrying out improvement projects in crop and livestock enterprises
   b. Carrying out improvement projects in farm-family living
   c. Reclaiming land by clearance, drainage, etc.
   d. Introducing an intensive crop or livestock enterprise
   e. Increasing the animal units, buying some feed if necessary
   f. Remodeling barn or other buildings to provide more or better facilities for livestock
   g. Developing special markets or ways of marketing, such as roadside markets, delivery of milk or eggs to consumers
   h. Introducing a program of erosion control or soil management
   i. Keeping farm records as a basis for improving the farm business and for developing partnership agreements
2. Rent and operate a farm or nearby piece of land as a part of the home-farm business or a separate unit.
3. Buy a farm or nearby piece of land and operate it as a part of the home-farm business or separately.

Often the home farm is, or can be made, a two-man farm business. This size is usually the minimum for profitable farming. With a two-man business, there will usually be room for one son farming full time. Activities in the above list suggest some of the ways by which the size of the farm business may be increased. If the farm business cannot be made at least a

two-man business, there is little opportunity for a young man to become established in farming on the home farm as long as the father is active.

Selecting and Planning the Farming Program. Principles of selecting and planning farming programs are outlined in Chap. 8. Generally speaking, a young man's farming program will be of larger scope than that of a high-school boy. Some implications of this fact for selecting programs may be seen in the preceding paragraphs. The program must be selected in the light of the farming status of the young man, which may be at any point from farm laborer for wages at home to farm operator. A great many of the young men may be expected to be farming at home as a partner in one or more of the productive farm enterprises.

Supervised practice always implies planning. However, plans by young farmers should not be elaborate or involved. They should be plain, clear, definite, and simple. As long as the farming program consists of projects and supplementary farm practices, the project plans should perhaps include these things:

1. Scope of the enterprise
2. Production to be secured
3. Rental or trade agreement
4. Probable returns (or financial budget)
5. Financing
6. Improved practices to be carried out

When a young man shares in the enterprises or total farm business, perhaps he should use a farming-plans book if a suitable one can be obtained.

The rental or trade agreement is particularly important in a young man's farming program. Agreements are discussed on pages 196 to 202. A good agreement states clearly what a

landlord is to do and furnish, what the young man is to do and furnish, how the returns are to be divided, and the duration of the agreement. It should be fair and equitable to both parties. The basis of a fair trade is: Each party shares in the returns (or losses) according to the contribution each makes toward producing the returns.

Keeping Records. Young men should keep records on their farming programs. Otherwise, they will not learn to keep records, nor can their results be evaluated. Unless a special young-farmer record book is prepared for the state, young men whose farming programs are made up of projects and supplementary farm practices may well use the same record book as the high-school boys. If the young man keeps records on the total farm business, he should use the record book that adult farmers use for that purpose. Keeping records is discussed on pages 205 to 210.

Visitation and Teaching on the Farm. The teacher should know when the critical or crucial periods occur in the farming program of the young man and should be sure that the young man is prepared to meet these situations. Also, the teacher should make his supervision a vital part of the teaching process. As with high-school boys, every opportunity should be utilized to foster good parent-son relationships, and a record should be kept of supervisory visits. Visitation and teaching on the farm are discussed on pages 218 to 228.

CHAPTER 11

TEACHING ADULT-FARMER COURSES

The national acts in vocational education provide for the training of both present farmers and prospective farmers (see page 242). Adult-farmer courses are for adults who are already established in farming, most of them as farm operators. Figures are not needed to show that there are adult farmers in a farming community. Usually there are several times as many adult farmers as high-school boys in vocational agriculture, frequently ten to fifteen times as many.

Adult farmers will take advantage of courses for them if good courses are provided. They have been doing so in large numbers for a long time. Only the ability and desire of schools to meet the needs hold back the further education of older farmers. Adult-farmer courses (sometimes known as short courses or evening classes) have been conducted in the public schools almost as long as have high-school classes in vocational agriculture, under the Federal acts. In 1920–1921, federally aided evening classes were reported for the first time, there being 112 classes. Today the combined adult enrollment in all types of agriculture classes is double the enrollment in high-school classes. And we are faced with a tremendous potential expansion of education for adult farmers. From now on, courses for adult farmers will be one of the principal concerns of departments of vocational agriculture.

If schools in a farming community believe that education is a continuous process and that there should be a community program of education, they will provide education for adult farmers. Adults are important people in a community, with

important lives to live. Adults *must* learn; they have no other age at which to learn. In every farming community there is the possibility of improving the farming practices or remedying certain deficiencies in agriculture. Older farmers are almost, if not quite, as ready to adopt sound new practices as their sons are; they are perpetual pioneers and innovators. It is said that no implement factory could survive two seasons unless farmers tried out new tools and devised improvements on them. Adults control the farms and can put their ideas into immediate use. Improving the farming improves the community which supports the school. Adult farmers will be educated at public expense by some agency—the schools or some other public agency. The school is the agency whose only interest is education and whose atmosphere is educational. Adults tend to support liberally that agency from which they receive something directly. No agency outside the school has the staff or facilities for providing adequate education in agriculture for all the adult farmers who can benefit from it.

Teaching adults is important for the school and the teachers in the school. As just stated, adults support the school and tend to give their allegiance to agencies from which they receive direct benefit. Adults should turn to the school for educational service. It is unfortunate if the school is to be looked upon as serving only the children. Teaching adults helps develop teachers and contributes to keeping them alive and adaptable, thus increasing the efficiency of their teaching of other groups. Regular in-school students have greater respect for teachers who help solve the problems of adults; and the adults have greater respect for the teachers of their children. Teachers need the experience of dealing with the adult problems whose solving the youngsters are being prepared for. Teaching adults also aids teachers of agriculture in understanding the parents of the boys and young men in their

classes, and aids the parents in understanding the teachers of their sons.

Adult education in agriculture by the schools renders a distinct service to other agricultural agencies. Through adult-farmer courses, farmers become better able to use the other agencies intelligently. Particularly do they become better able to read and interpret the literature that is provided for them.

Agriculture teachers have been pioneers in education for adults in rural communities. They have "blazed the trail." After adult courses in agriculture, other adult courses have followed—in homemaking, general education, etc. In their pioneer work, teachers of agriculture have made and are making a great contribution to adult education in general.

What an Adult-farmer Course Is. An adult-farmer course in vocational agriculture consists of classwork and the supervision on the farm of the practices and improvements discussed with the farmers in class. Characteristics of an adult-farmer course are:

1. Members of the class are definitely enrolled in the course.
2. Those enrolled are expected to attend class regularly.
3. The course deals with a subject; it is not a series of unrelated lessons. The farmers do not meet to be entertained, nor ordinarily to listen to a lecture.
4. While much of the classwork may be at the rate of one or two meetings a week, instruction and class organization should extend over a relatively long period, preferably twelve months during the year.
5. The instruction should result in the improvement of farm practices or, at least, in improvement of farming and farm life.

How Different from Agricultural Extension. The adult-farmer work being discussed is a part of the educational program of the school, through its department of vocational agriculture. It consists of giving courses of ten or more meetings in length that deal with one subject and includes the necessary supervision of the activities related to the course. This plan or pattern is generally known as "systematic instruction." Vocational education in agriculture has no other pattern. Adult-farmer work does not duplicate what is done by the Agricultural Extension Service. The two types of work, carried on by different agencies, are different. Agricultural extension work is carried on by the U.S. Department of Agriculture in cooperation with the land-grant colleges in the states. In the communities the work is done through county agents. The county agents do not teach organized classes; they do not offer a fairly long series of lessons on one subject. (Extension teaching of agriculture is discussed in Chap. 14.)

County agents may, and often do, hold meetings with groups of farmers while doing their extension teaching. More than one meeting may be held on a subject, but there are seldom more than three to five meetings, seldom a definite enrollment; and attendance usually shifts considerably from meeting to meeting. Much of the extension teaching of adults is done through demonstrations at appropriate places, lectures and addresses, exhibits, personal visitation on farms, articles in papers, and through supplying farmers with information in leaflets, circulars, bulletins, and the like.

Both agricultural extension for adults and adult-farmer courses by the school have their place. Each supplements and complements the other in educating farmers.

Characteristics of Adult Farmers. Certain ways in which young men on farms are different from adult farmers are listed on pages 248 to 249. Compared with young farmers, adult farmers have:

1. More farm experience. Most of the adults operate farms as owners or renters. They have a larger background of experience with which to solve problems, the combined experience of the class members being very large.
2. More freedom to carry out improved practices by virtue of their being the farm operators
3. Less reading ability and less willingness to read to solve problems, taking the class as a whole. Adults have been out of school longer than young men; on the average they stopped school sooner. Farmers are not disposed to burn midnight oil or electric current in reading. The eyesight of adults is poorer than when they were young. The percentage of persons with visual handicaps increases from approximately 23 per cent between the ages of 10 and 19, to 39 per cent in the age range 20 to 29, to 48 per cent at ages 30 to 39, to 71 per cent, 82 per cent, and 95 per cent in the next three decades of life.
4. Less basic training in agriculture (in most communities)
5. Less need for occupational guidance
6. Less inclination to admit ignorance. A very young person accepts learning as life's business, but the average adult must have courage to admit ignorance.
7. More capital and larger farm business
8. More influence in community affairs
9. More organizations to belong to and work through
10. Larger family responsibilities. Most adult farmers have established a home.

The Adult Learning Process. Adults learn in the same ways they learned when they were younger. (Adult learning is also discussed on pages 47 to 49. Some of the statements made there bear on adult education.)

The primary, inescapable fact of adult education is that

adults have no other age at which to learn; they cannot be transmitted back to their youth. They must learn. Otherwise, the amount of their learning becomes less and less by the process of forgetting; they become ill-fitted to live in a changed and changing world. Changes do take place. Economics change, interests are born, demands are created, new practices are proved better; and adults have to meet these changes. Being able to adjust to new conditions may mean the difference between success and failure.

Some of the principles that have been established regarding adult learning are:

1. Adults can learn. At 45, people are as capable of learning as they were at the ages of 18 or 20, which may be seen in the graph on page 46. This is largely because of their accumulation of experience and other learning. Added maturity actually makes it easier to learn many things. Some manipulative skills become harder to learn, but even with these the door is seldom shut on learning because of age.

2. Brighter adults learn faster than dull ones, just as when they were young. The boy who learns slowly becomes a man who learns slowly. Adulthood does not bring an improvement of mental capacities. The teacher of adults must face the problem of individual differences. The differences are greater than with high-school boys, because their learning has made them more different from each other. (Learning tends to make people different from each other.)

3. The chief motive to adult learning is what the adult terms the "practical." Adults expect to use what they learn. Education for them is voluntary; they do not have to learn in order to earn a credit or make a grade. Adults are not interested in "preserving and passing on a cultural heritage." Teachers can succeed in teaching only those things for which the adults feel a need or for which a need can be stimulated.

Adults, of course, may feel a need for understanding, even a need for theory.

4. Adults need more time for learning many things than do youngsters in their teens. The learning process with students of all ages is often hurried too much. Teachers of adults must allow them enough time to learn; attempts to hurry up adults unduly may spoil the results. Speed of reaction slows down with increase in age.

5. In learning, adults, as children, must begin with and use what they have already learned. Adults have learned much more than children. They may be expected to have learned some attitudes and practices that interfere with new learning. All people must tackle each new problem on the basis of what they have learned before.

6. Most adults reject authoritarian and teacheristic attitudes in teachers. This fact may have caused James Whitcomb Riley to write these lines:

> Milt ust to teach; and 'course his views
> Ranks over common sense;
> That's *biased* me, till I refuse
> 'Most all he rickommends.

Adults have had individual liberty and independence, and have been treated as adults rather than children. They want to think for themselves. However, they will show real respect for competence in teachers. While they will not be treated as children, they have adults' respect for mastery. They respond to leadership that recognizes their maturity, that treats them as thinking persons, that capitalizes on their experiences and special abilities. Adult teaching is no place for a boss or a formal pedagogue.

7. There are certain areas of learning that can be undertaken only in adulthood. Agriculture has many such areas. In some areas boys have no chance to practice, and therefore little

incentive to learn; nor have they a background for the learning.

8. In general, the volume of interests does not shift materially as people grow older. Certain interests become less intense, especially those concerned with physical activity, but seldom do the interests upon which adult education depends become significantly less. The interests of adults are ready to be used to motivate their learning.

General Objectives of Adult-farmer Courses. Every adult-farmer course has, or should have, its *specific* teaching objectives. The above heading, however, refers to the *general* objectives or things to be accomplished through the teaching of adult farmers. The over-all aim of adult-farmer work is to increase the proficiency of the class members in farming and farm life. The increased proficiency is brought about through developing effective abilities to

1. Use the improved practices resulting from experimental work, other research, and the experience of farmers. These are the practices advocated by the college of agriculture.
2. Manage the home-farm business.
3. React to current and future conditions and to trends and changes that affect agriculture and farm life.
4. Improve their farming status.
5. Improve the home farm and farm living.
6. Solve their community and farm problems by thinking together and working together.
7. Use the agencies and literature that have been provided for them.
8. Preserve and extend democratic attitudes and ideals.

A School's Adult-farmer Program. The adult-farmer program should be planned to cover several years of instruction, and

should result in definite improvement of farm practices and farm life. It should have as its goal the reaching of all the adult farmers in the community. Perhaps not all the farmers can be expected to attend a course every year. The goal might be to have each adult farmer attend a class at least every other year. Reaching numbers, of course, is not the primary aim, but if farmers are to be served, they must be reached.

Such a program will require more than one teacher in the department. There should be enough teachers to carry on the needed program. Successful farmers and mechanics may teach courses or may assist the regular teacher or teachers. They will, of course, need supervision. The county agent, soil conservation man, and agriculturists in other agencies may contribute to the teaching, though they should not be expected to teach an entire course. Enterprise specialists trained in teaching may be employed to teach the same course in several neighborhoods. It is very desirable, for a number of reasons, that teachers of high-school boys also teach adult-farmer classes. The adult-farmer program should be a definite part of the school program. The regular head teacher of vocational agriculture should be in charge of it.

Size of classes is related to total number reached and to the cost per farmer reached. However, the amount of learning that takes place is the important thing. Mere number in the class has no virtue. There is no best size for all adult classes. The best size depends on the nature of the subject, amount of individual attention required, facilities available, ability of the teacher to handle a group, and perhaps other factors. It is difficult to have enthusiasm and interest in a group that is too small. Most states have set ten or twelve as the minimum number of farmers in a class. Discussion among class members that will be most profitable to all present is likely to be difficult, if not impossible, to secure if the group is too large.

Class meetings range from 1½ to 3 hours in length, and

may be held at the high school or at other centers in the school-patronage area. In some schools it is necessary to hold class meetings in outlying centers if the farmers are to be reached.

The time of holding the class sessions should be at the convenience of its members. Classes may meet at any time of the day or night, on any days except Sunday, and at any time of the year. Perhaps at least ten to twelve meetings should constitute the intensive part of the course, with an additional meeting in each of the remaining months to deal with current problems and practices related to the course subject. The "intensive-course" meetings may be held at the rate of one or two each week, either on consecutive weeks or seasonally—depending on the subject, wishes of the group, etc.

The adult-farmer program should be a continuing program. One year's instruction should lead into the next. There should be a class organization, with a president, secretary, and such other officers as may be needed. Members of the class should assume the burden of keeping the program going. It should be *their* program, with the teacher serving as teacher, rather than *his* program, with the members coming "to help out." There should be an advisory council made up of class members to help plan the course, secure membership, and advise on various matters pertaining to the course.

The adult-farmer program should be a *teaching* program. Systematic instruction through classwork and supervision of practices should be a reality. As previously stated, members of the class should be definitely enrolled and should obligate themselves to attend class regularly. They should "take the course." Being members of the class, they are entitled to services from the teacher of agriculture that are not extended to farmers generally; they are entitled to his help on their own farms in dealing with problems related to the course.

It goes without saying, that no teacher will organize an

adult-farmer class without consulting the head of the school, since adult-farmer work is part of the school's program of education. Enrollment will need to be recruited, particularly where adult-farmer work is new. The advisory committee should be very helpful in securing class members. Most of the things said under recruiting young men for young-farmer classes also apply to recruiting older men for adult-farmer classes.

Teaching Procedure. Teaching procedure is discussed before course of study because of its bearing on the course. By whatever name the predominant group-teaching procedure may be called, it should consist largely of solving the problems of the class members which relate to the subject of the course, under the guidance of the teacher. That old-time recitation will not appeal to the farmers is obvious. Nor is the lecture method well suited to the purpose, for reasons which may not be quite so evident. Generally speaking, the teacher of adult farmers should not lecture to them, because:

1. The lecture gives the farmers no opportunity to participate in solving their own problems.
2. It fails to make educational use of the large combined experience of the men in the class.
3. Few teachers measure up to the requirements of a lecturer. A lecturer should be a specialist in his subject, should be skilled in lecturing, and should have a reputation that will give him the confidence and respect of the group as a lecturer.
4. While the lecture has its place in teaching, it is usually an ineffective way of directing the activities of adult farmers so as to result in desirable learning.

Using problem solving in teaching is discussed in Chap. 5. The group problem solving used most with adults is some-

times known as a conference procedure or a modified conference procedure. It makes good use of the wide knowledge and experience of the adults and places the teacher in the position of being a group leader rather than a specialist in the subject. As group leader the teacher still can make contributions to the discussion. The usual steps in group problem solving with adults are about these:

1. The problem to be discussed at the meeting is clearly understood. It should be written on the board where all can see it. It may have been announced, and even developed, at the previous meeting. The problem to be dealt with delimits the field of discussion; the farmers have met to discuss this particular thing, not something else. The problem should be made to seem an important one to discuss.

2. The teacher (group leader) asks the group what things will need to be discussed or considered in solving the problem. If the teacher has prepared himself to meet the group, he will know what these things are. As each of the important things to consider is mentioned by a farmer, it is written on the board if the group feels that it should be discussed. The teacher continues to analyze the problem with the group until all the important things to consider have been listed. It is good practice to list them finally beneath the statement of the problem in the order in which they will be discussed.

3. Lead the group in discussing the thing or factor that should be discussed first (if the order is important). Guide them in establishing facts on it—from their own knowledge and experience, to the extent possible.

4. *After* the group has made its contribution in step 3, there may be additional data, results, or other facts, or authoritative opinion that the teacher needs to supply. What the teacher contributes here is not from his experience, nor is it what he thinks. He usually tells the group the source of his information (unless the information is generally known, for

example a scientific fact). Thus the teacher is not posing as a specialist in the subject, nor is he displaying his "vast information." He humbly makes his contribution out of his training and lesson preparation, which is to be expected. The farmers contribute chiefly out of their experience, which is also to be expected. The teacher has safeguarded himself, and the farmers' valuable contributions receive consideration.

5. On the basis of the contributions in 3 and 4, lead the group in arriving at a decision on the factor or thing being considered, if a decision is warranted.

6. Take another factor and proceed through steps 3, 4, 5, in the same manner; and so on, until all the things have been considered. As the meeting should stop on time, any factors still to be considered may be carried over to the next meeting.

7. The group should come to such a conclusion to the problem (answer to the main question) as may seem desirable. If the conclusion is the sum of the parts (see page 128), it has already been arrived at. If the conclusion is not the sum of the parts, it is still to be arrived at. The *group* should conclude; the teacher is not to tell them what they should decide. If there seems to be agreement, it may be well for the teacher to state what "seems to him" to be the thinking of the group. Any improved practices agreed on should stand out clearly.

A variation of the procedure just outlined is to have a subject for each meeting, instead of a large problem. Then the problems that will need to be solved in dealing with the subject are drawn from the group. This usually results in securing several relatively small problems which can be solved one by one in much the same manner as outlined for handling the "things to be considered." In reality, these smaller problems constitute an analysis of the subject, whereas in the procedure first outlined they become the things to be considered in solving the larger problem. For the teacher preparing to meet the

class, they are *anticipated* problems to be solved in discussing the subject.

Whichever of the two procedures is used—*one large problem* for the meeting, analyzed into the things to be considered, or a *subject* with several small problems—material for adults should be divided into brief, clearly articulated units. Either of these two procedures will accomplish this. At every moment the adult should be able to see the bearing of what is then being discussed upon the general problem or subject he is trying to understand. (Of course, this is good teaching anywhere.)

It is a good practice to make the next meeting of the class seem worth attending. The group may be interested in finishing solving the present problem or discussing the present subject, if it has not been completed. Or a new problem or subject for the next meeting may be developed. At the first meeting of the course, the group should understand that the discussion procedure is to be used. They will like it.

It is greatly to the advantage of the teacher in making his contributions if he has simple tables, graphs, and the like, in chart form to use. In so far as possible, they should show relevant material only. There are many kinds of visual aids that will be helpful to the teacher in his presentations.

The solving of group problems as outlined above does not rule out the possibility of discussion through panels, forums, and symposia. Nor does it mean that an outside specialist or speaker may not be used. Such a person may be able to conduct a discussion or he may give a talk or lecture. He should, however, by all means know what the problem or subject is for the meeting and receive specific instructions to stay within the subject. Otherwise, he may spoil several future meetings.

Demonstrations should be used for teaching certain practices involving manipulation. Usually members of the group can give, or help give, the demonstration. Conducting a dem-

onstration is discussed on pages 150 to 151. Developing manipulative abilities is discussed in Chap. 6.

There may be group instruction on the farm, other than demonstrations that involve a manipulative ability. Often there are occasions to use result demonstrations in teaching—observe the results from certain practices, etc. Tours may be used in seeing result demonstrations and for other teaching purposes.

Lesson Plan. All adult teaching should be carefully planned, to achieve the teaching objectives. The lesson plan for use in solving problems may consist of (1) a statement of the problem, or of the subject and anticipated problems, (2) the things or factors to be considered in solving the problem, where a single problem is to be used, (3) the specific contributions the teacher will probably need to make (in a convenient form for presenting), (4) statements of such conclusions or practices as the teacher hopes the group will agree on, (5) any other notes he may need, such as situations that give rise to problems, suggestions for motivating the group, etc.

Planning for a demonstration or tour or panel must be just as careful as for a discussion, if it is to go off smoothly and not fall through because something has been overlooked or neglected.

Course of Study. Each year the subject of the adult-farmer course (or subjects of courses) should be one that is of great interest to the farmers. It may be an important enterprise in the community or it may cut across enterprises as would a course in farm management, soil improvement, feeding farm animals, or producing feed. The subject of the course and what to include in the course should receive careful consideration by the teacher, with the help of his advisory committee. Much of the success or failure of the adult-farmer school depends on the course that is worked out. Advice may be secured from any person capable of giving it. The county agent

will perhaps have some valuable suggestions; likewise, the representatives of other agricultural agencies in the county or community. However, the teacher is the trained person who should be responsible for the detailed work of course building. It is he who will "teach the course." He should take the lead in deciding on the course. Obviously, if the advisory committee is to be of help to the teacher in making decisions on the course, it must know what an adult-farmer course is (see pages 269 to 270).

The teacher must be familiar with the farming programs of the farmers in his community. Many teachers find it helpful to have a list of their farmers, with the chief enterprise or enterprises on the farms. For example, if the teacher has a list of the dairymen, sheep producers, beef-cattle feeders, beef-cattle breeders, poultrymen, farmers with two or more brood sows, part-time farmers, truck farmers, fruit growers, and the like, he can at any time decide which group or groups should receive instruction during the year and contact these men. Being familiar with their farming programs and problems, the teacher is in position to talk with the farmers about the adult-farmer work and can get the course under way with the least loss of time and energy.

The subject of the adult-farmer course should be decided on before the farmers are invited to attend it. Few people are interested in attending a course when they do not know what it will deal with.

An adult-farmer course of study for the teacher's use consists of about these things:

1. Teaching objectives, in terms of the abilities to be developed in the farmers (or in terms of other learnings). See Chap. 3. Any changes or improvements in farming are to be brought about chiefly as a result of what the farmers learn. The instruction should lead to improvements in farming. It is quite all right and it may be very helpful to have goals other

than learning goals, but most of these should be achieved through the learnings that result from the teaching.

2. Statements of the problems to be used in class discussions, in attaining the teaching objectives. Usually, attaining a large objective will require using one or more problems. Problems arise only in situations; so the teacher must know the situations that give rise to the problems that are to be used.

3. Analysis of each problem, indicating the factors or things that will need to be considered in solving it (for an illustration, see pages 98 and 128).

4. List of the teaching materials the teacher may need to use in making his contributions to the group problem solving. These materials include his charts and references to books, bulletins, etc., by pages.

5. Statements of conclusions, improved practices, and the like which the teacher hopes to come out with when the problems are solved by the class, under his leadership and direction.

Several states publish adult-farmer-course outlines that are very helpful to the teachers. The outlines must be adapted to the needs of the persons in the class, but the statements of possible teaching objectives, the analysis of the problems, and the lists of suggested teaching materials and improved practices save the teachers much time in working out their courses. Good published outlines usually result in better courses, and more courses, being taught.

Supervised Farming. The teacher must assume responsibility for supervising the practices he would have followed by adult farmers. Supervised practice for adults involves essentially the same kinds of activities that are engaged in by the high-school boys, but the names are different.

1. Productive projects. For the adult a productive project becomes an “enterprise,” the word “project” ordinarily not being used with adults. He receives supervision in the enter-

prise or other aspect of farming that is related to the subject of the adult-farmer course.

2. Improvement projects. Hardly an improvement is brought about on the farm that is not an adult undertaking. Any complete-cycle improvement related to the course may have the supervision of the teacher, but without calling it a project. Examples are: Terracing a field, landscaping the farmstead, building and equipping a farm shop, improving the dairy herd through a program of testing and records.

3. Supplementary practices. Introducing new practices and acquiring new skills by farmers take the place of supplementary farm practices that boys and young men carry out.

Early in the adult-farmer course, the teacher (group leader) should explain how such service as he can render is available to members of the class in carrying out anything discussed in the course. He should make it plain that only in so far as people carry out their decisions are the decisions worth anything. Then he should be sure that the teaching reaches the *doing* level. He should use what is known about teaching an improved practice (page 167). As the course goes on, the teacher should lead the men to decide on many things they will do. The offering of his service must not be just a "blanket offer"; the teacher should make it a point to know when he can be of help to a class member and should go to see him at that time. He should succeed in getting plans made by the farmers (though they may not be written) and he should assist them in carrying out their plans. A plan is a commitment to do something. It is always wise, when possible, to get people to commit themselves to do the things you would have them do.

In supervised farming with adults, much stress is usually placed on getting improved or approved practices followed that *are related to the classwork*. Examples are terracing, liming, feeding a protein supplement, spraying, using a certain

variety or strain of seed. The teacher assists the farmers in carrying out the practices and in evaluating the results. He teaches the farmers on their own farms, may conduct tours with them to see the practices or results by other farmers, and may render them any other kind of service that will aid them in carrying out the better practices. The effectiveness of the teaching will be evidenced by the improvement in the farming and farm life.

Supervised farming should not be limited to improved or approved practices as the term is usually used, and the results must not be gauged by mere number of practices introduced. Some practices influence the results much more than others. Success in farming and farm life is the important goal. Some of the factors that determine success or failure are exceedingly significant, whether or not strengthening such factors constitutes improvements in practices. For example, increasing the size of a farm business, introducing a new enterprise, discontinuing an enterprise, securing an equitable rental agreement, or making better use of the land may greatly affect the outcome in farming.

Record keeping is usually stressed less in the supervised farming with adults than with boys or young farmers. Of course, records are encouraged, but record keeping by the farmers is wholly voluntary. The teacher should render any service possible in getting records kept and interpreted that contain usable information.

Members of adult-farmer classes often have an opportunity to work together in accomplishing certain things in their supervised farming. They may cooperate in procuring a particular kind of service, in buying needed equipment or supplies, in marketing a product, etc. The teacher should assist the class members in their cooperative activities.

Supervising the practice of adults requires visitation, just as does the supervision of members of other classes in agri-

culture. Considerable teaching should be done on the farm (discussed on pages 222 to 223). No one can say how many supervisory visits should be made per class member. Perhaps there should be at least three visits per farmer. Visitation should not be delayed until the intensive course is over. It should be given whenever the need for it exists. Visits should be made throughout the year.

It is necessary that the teacher keep records of his supervision of practice. He needs a record of his visits to adult farmers just as he does of his visits to boys and young farmers. He should have a record, by individual class members, of what the farmers do that may be called supervised farming activities.

CHAPTER 12

TEACHING ELEMENTARY AND PRE-VOCATIONAL AGRICULTURE

Early in this century elementary agriculture was quite generally taught as a school subject; it was taught in nearly all of the Southern states. Argument for it was advanced as early as 1850. At that time the governor of Iowa said, in his message to the legislature, "It would therefore seem to be our duty to inquire whether books relative to agricultural science, can, with propriety, be introduced into our normal and common schools." Today only a few states require the teaching of agriculture in the seventh or eighth grades, though some agriculture is taught in a number of other states. As vocational agriculture under the Federal acts has developed in the high school, elementary agriculture has declined. General science has, to a large extent, replaced agriculture in the elementary curriculum.

Many educators feel that the decline of agriculture in the elementary schools of America is unfortunate. They argue that children should be taught in terms of their environment and that, since the elementary school is the school through which all people pass, it is unwise for public education to fail to concern itself with the agricultural education of children under 14.

The major difficulty encountered in the teaching of elementary agriculture is that the teachers are unprepared to teach it. They are also overworked with other teaching and lack time for agriculture. Many of them do not have desir-

able attitudes toward farming and farm life. It is perhaps better that elementary agriculture not be taught than to be handled by teachers unprepared in agriculture who conduct only "re-citations" in it and who do not have a wholesome respect for farming vocations. But teachers can be trained in the elements of agriculture, just as they can be trained in social science or anything else. Teachers who do not respect farming vocations should not be employed to teach rural or town children.

What Elementary Schools Can Do. Elementary schools can do several things toward solving the problem of teaching agriculture. Much agriculture can be taught without offering it as a separate subject. If the school program is related to the life of the pupils outside the school, agriculture will be taught. Good teachers of other subjects in rural schools will teach them in terms of the rural environment. Thus they will teach agriculture. They need not wait until the seventh or eighth grade to begin this teaching. In some experimental work financed by the Sloan Foundation, "applied economics" has been brought into the schoolwork from the first grade on—in the reading, English, arithmetic, etc. This indirect teaching has influenced the practice in diet and food production in these communities, as compared with "check" communities. Children in the experimental schools have made as much or more academic progress as children in the control schools.

One of the greatest contributions the elementary school can make is the building of desirable attitudes toward farming, which, of course, is possible only if the teachers themselves have these attitudes.

Every elementary school can provide an agricultural library for use in the pupils' free time, as a reference library in the teaching of other subjects, and for use by the community. There are good agriculture books written on the reading level

of grade pupils, and there is a wealth of free materials if the teacher only knows what to get and where to get them.

Many rural boys and girls own some kind of livestock and earn money for themselves by growing some crop. If the elementary teacher is wise, he can use this beginning to teach the significance of ownership of property—how property that one can handle, use, and take care of has a great influence on its possessor. Property that responds to treatment carries on a silent conversation with its owner; he knows whether it is being neglected, how his care affects it, how he and it are getting along together. Since the owner is free to work at his plans, he learns to value such freedom. The youngster learns what it means to pursue a purpose, what it means to *create*. He learns what kind of a person he is and has a glimpse of what he may become. (He will be likely to be, of course, what he is now becoming.)

Agriculture cannot be left out of good elementary school teaching. Here are some things of an agricultural nature which an elementary teacher and his pupils meet in the usual subjects:

- How ordinary plants grow
- Low forms of plant life—molds, bacteria, etc.,—how they live and reproduce
- How ordinary plants and animals reproduce
- Soil formation and conservation
- Identification and control of insects
- Birds and how they affect farming and farm life
- Trees and shrubs for the farm home
- Farm forestry
- Agricultural arithmetic
- Agricultural history (including that of some important crops and livestock in the community)
- Agricultural geography

Agricultural English (correct use and spelling of terms, writing and reading about farming and farm life, agricultural literature including poetry)
Farm sanitation—health
Farm-animal health as related to feed (proteins, vitamins, minerals, etc.)
Contributions of agriculture to society
Contributions of agricultural sciences to the welfare of man
Intangible values in farming
Outstanding achievements in agriculture (on equal plane with other outstanding achievements of man)
Music—songs associated with farm life
Art—in terms of things found in the country
The work of various agencies in the improvement of agriculture and farm life.

Elementary schools can do still other things of an agricultural nature, with such assistance as the teachers need and can get if they will ask for it. They can landscape their grounds, using native trees and shrubs. Pupils can do most of the work, which is a real educational experience. They can be in on the planning, too, even though an agriculturally trained person may do part of the planning. Schoolrooms may be decorated with flowers and other things from the farm. Directing these activities is an excellent way of promoting the learning process. Such undertakings can be counted on to influence the farm homes while bringing about desirable changes in the behavior of the school children.

Teachers in elementary schools can and should give their encouragement to 4-H club work. The club work should be correlated with and fit into the work of the school.

A few states have an excellent course of study in elementary agriculture. Good suggestive courses of study are very helpful to teachers. States could give more assistance than most

of them do in selecting teaching materials. There are a few textbooks written for use in the upper grades. Some colleges offer courses in agriculture for elementary teachers.

Assistance That Teachers of Vocational Agriculture Can Give. Prevocational agriculture is discussed under the next heading in this chapter. The present discussion is on agriculture in the elementary school whether or not it has prevocational value. Teachers of vocational agriculture, who are college-trained in agriculture and agricultural education, can make a distinct contribution to the teaching of agriculture in the grades. They are interested in what is done in the grades, not only because it directly affects the life of the community but because they depend on the grade schools for their future pupils in vocational agriculture. The attitudes these pupils have acquired in and about agriculture are extremely important in their later education.

In some states many teachers of vocational agriculture also teach agriculture in the last grade of the elementary school, because of its prevocational value. This is usually feasible only when all or nearly all the prospective vocational pupils go through the same elementary school or where the elementary agriculture which the vocational teacher does not teach is taught under his close supervision. Otherwise, his first-year vocational pupils come to him with school training in agriculture that is too different.

Vocational teachers have done various things in helping teachers in the elementary school. They have acted as special supervisors of the teaching of agriculture in the elementary schools in their high-school patronage areas. The supervisory help has varied much. In some instances it has consisted of acquainting the elementary teachers with available teaching materials. Teachers of vocational agriculture can help elementary teachers select and procure these materials. They can help the schools build up their agricultural libraries to be

used by the community as well as by the pupils. In a few states some vocational teachers have met one Saturday a month with the rural teachers served by their high schools, to work with them on their teaching of agriculture. Agriculture teachers have helped elementary teachers plan the landscaping of their school grounds, put on agricultural programs, fairs, contests, result demonstrations, and the like.

In states that have summer "workshops," teachers of vocational agriculture may have the opportunity to work with elementary teachers on their teaching of agriculture.

Vocational teachers often help the elementary teachers acquaint upper grade pupils with the high-school work in agriculture. This is sometimes done through personal appearance of the teacher before the elementary pupils, programs put on by the F.F.A. or N.F.A. chapter, visiting days at the high school, furnishing the grade teachers with printed, illustrated materials—prepared on a state basis in some states.

Teachers of vocational agriculture can help elementary teachers plan and conduct field trips and excursions to farms and agricultural business places, which should have much educational value.

Prevocational Agriculture

Agriculture late in the elementary school may or may not be prevocational in nature. It may not have been planned to have any relationship to vocational agriculture in high school. Agriculture in the seventh or eighth grade, as usually taught, is not an effective means of self-discovery in vocation. The reason for this has been discussed already. If prevocational agriculture is not offered in an upper grade, a year of it may be given in high school, as mentioned on page 90, leaving three high-school years for vocational agriculture. Practices in regard to these things vary. The question of what ought to

be done in agriculture prior to vocational agriculture is not easy to answer.

Vocational education in agriculture assumes that at least a tentative choice of agricultural vocation has been made by the pupils, that they elect the vocational course on the basis of an intelligent decision. Where a choice of vocation has not been made, the pupils who take vocational agriculture certainly should be expected to have an interest in it which is based on knowledge and experience. They should also have the capacity to profit by the course, and facilities should be available to them for engaging in the necessary supervised practice.

Basis for Choosing the Curriculum. Neither age nor amount of schoolwork completed is evidence that a pupil should take vocational agriculture. These do not determine the "needs of pupils." A boy of 14 may be an imbecile, moron, dull, of average intelligence, bright, or a genius. His age has nothing to do with this fact. Nor does age indicate the amounts or kinds of experience the pupil has had or the abilities developed.

Progress and quality of schoolwork are some index of intelligence, but they do not indicate amounts of experiences except the usually limited school experiences. Some school administrators in the past have thought that lack of progress in schoolwork was indication that boys should take vocational agriculture. New departments frequently have drawn far too many "dullards" and "drifters," boys who do not get along well in other studies. Two causes contribute to this result: The election of boys themselves, and the advice of teachers and school administrators. On the part of boys, a new course offers an avenue of escape from other classes and subjects into something different. They "elect" the agriculture. The advice given is ill-founded. Pupils who do poorly in one subject tend to do poorly in other subjects. There is a high correlation between the kinds or types of intelligence. That is, a boy

high in one kind of intelligence is likely to be high in other kinds, and vice versa. Furthermore, operating a farm calls for at least an average amount of abstract intelligence; farming is not just "working with one's hands." The conception that agriculture is for those who cannot do other schoolwork well thwarts the basic principles of vocational education.

A major problem of the modern school is that of enabling pupils to have the experiences they must have if they are to choose intelligently a curriculum to suit their needs. Too little attention has been given to this problem. The statement made by Dr. T. H. Eaton in 1923 still stands as a challenge: [1] "No problem in educational administration is more urgent or, perhaps, more difficult than that of devising and putting into operation a range of selective opportunity for vocational choice, among many vocations, non-rural as well as rural, particularly in the open country."

Participating Experience Necessary. Information about occupations is not a test of interest or ability in them. If the principle of self-discovery is to be utilized, the pupils must have firsthand experience that will enable them to make a vocational choice. Not just any farm experience serves a boy's purpose in choosing a farming vocation. For example, a boy may have grown up on a farm and worked hard enough there, yet he may have had no experience in planning or management, assumed no responsibility or financial risk, had no control of capital—the chief requisite in farming above hired-hand status. Lacking such experience, the boy cannot use it in his thinking.

Here, apparently, is a baffling problem for vocational education in agriculture: how to provide adequate vocational experience for boys before they begin their vocational prepa-

[1] T. H. Eaton, *Vocational Education in Farming Occupation*, J. B. Lippincott Company.

ration. Those responsible for administering the Federal acts in vocational education have permitted full-time teachers of agriculture to teach prevocational agriculture under the assumption that the teaching contributes to success in the vocational program. Drawing the line between the vocational and the prevocational is not easy when we concede that vocational experience is necessary to vocational choice. What activities and experiences to provide as prevocational agriculture that will be of greatest value to all the pupils enrolled and that will at the same time be a background for rather than interfere with vocational preparation later is the problem to be worked out.

Some Standards of Prevocational Agriculture. Prevocational education in agriculture is fundamental to successful vocational agriculture. Thus we are concerned with what constitutes the essential characteristics of this education, whether it precedes the high school or comes in the early high-school years. It may be that the last grade of the elementary school—seventh or eighth—is too early to give prevocational agriculture as such. No argument is advanced here on this point. There are those who believe that the prevocational work should come in the ninth grade.

Management is the prime factor in a farming vocation that assumes responsibility, risk, and control of capital. Therefore the pupil, prior to his vocational choice and vocational training, should have experience in the management of agricultural production while at the same time gaining skill in the manipulative operations of producing a crop or livestock product under vocational conditions. Such an undertaking will provide the opportunity of self-discovery of vocational capacity in agriculture or lack of capacity. It should call for developing and using the elementary abilities needed in the agricultural production. Classroom teaching and supervision on the farm will speed up the learning and cause the undertaking to yield

the greatest amount of helpful experience. As stated above, different opinions exist as to when such work should be done in school. There is no valid reason, however, for believing that upper grade boys are too immature to assume management responsibilities. They can manage, they can assume responsibility, just as surely as they can reason. If they cannot at this age, they will never be able to.

Many boys reared on good farms have assumed responsibility of their own accord or had it "thrust upon them." They have had enough prevocational experience in agriculture to begin their vocational preparation. The farm experience of many other boys is much more limited. If all boys had the experiences of the first group, the need for prevocational agriculture would be much less. Since they have not had these experiences, prevocational instruction in agriculture must be given in a democratic system of rural education.

To reach all boys who should be reached, prevocational education must be given in the schools. Well-conducted 4-H club work could make a valuable contribution in this connection if it were done through the school or properly coordinated with the work of the school. To serve a real prevocational purpose, valid educational objectives would have to be formulated, the boys would have to assume responsibilities, projects representative of farming would have to be chosen, and adequate supervision of the projects would have to be given by trained persons.

Although what is done in prevocational agriculture may contribute to vocational preparation later for those who elect the course, it should be worth while in itself to all the pupils—those who take the vocational agriculture and those who do not. Prevocational agriculture should not be offered solely in terms of preparation for the later vocational work. Development of the individuals and self-selection of a vocation are more important than a mere means of increasing efficiency in vocational agriculture.

CHAPTER 13

TEACHING GENERAL AGRICULTURE IN HIGH SCHOOL

Agriculture in the elementary schools probably reached its zenith in the United States about 1910 to 1915. By this time the high-school movement had gained headway in the country. Agriculture waned in the elementary schools as it developed in the high schools, where it had first been taught. After 1917 (passage of the Smith-Hughes Act) vocational agriculture spread quite rapidly in the high schools. With its development, general agriculture decreased. This has been the evolution of agriculture in the schools below college level since determined efforts were first made to relate the program of the school to life outside the school. It has developed as people realized that the practices of agriculture could be improved through the application of scientific principles. Paralleling the development of teaching agriculture in the schools has been the growth of agricultural extension.

Generally speaking, as we saw in the last chapter, the attempts at teaching agriculture in the elementary schools have not been very successful. Likewise, by and large, the programs of general or nonvocational agriculture in high schools have not been successful. They are at present, on the whole, weak and inadequate. The same reasons are usually given to account for the failure of both: teachers untrained in agriculture, many of them with poor attitudes toward agriculture, too many subjects to teach, and adherence too strictly to recitations from textbooks that are not suited to the needs.

A Place for General Agriculture. There is a place for high-school courses in agriculture that are not definitely vocational. In only a few states, however, are there many such courses. About 400 high schools in Iowa offer instruction in general agriculture. It is possible for courses in agriculture to encompass the functioning science needed by rural pupils and to enable the teacher to teach in terms of the environment better, perhaps, than any other subject. General agriculture contributes to all the recognized purposes of secondary education. This fact may be seen by one familiar with agriculture when he examines such a list as the cardinal principles or areas of instruction, formulated in 1918 by a committee of the National Education Association:

1. Health
2. Command of fundamental processes
3. Worthy use of leisure time
4. Worthy home membership
5. Vocation
6. Citizenship
7. Ethical character

Agricultural education should contribute to attaining objectives in all of these areas or general aims of education. In vocational agriculture the vocational aim is dominant, but a contribution is made to the other aims. Let us briefly explore the contributions of agriculture to some of the areas listed.

Dr. H. M. Hamlin of the University of Illinois has suggested that a public-high-school program of agricultural education should increase the ability of present and prospective citizens to

1. Share interests and recreations rural in nature.
2. Maintain desirable town-country relationships.

3. Deal ethically with others in agricultural affairs and relationships.
4. Participate in making public policies affecting agriculture and rural life.
5. Decide for or against country life and agricultural occupations.
6. Utilize agricultural products as consumers.
7. Find and use agricultural information and assistance.

Many of the leisure-time activities for a very large number of people are of an agricultural nature. These activities include care of the home grounds, vegetable gardening, growing small fruits and tree fruits, and the raising and keeping of poultry. Abilities in and knowledge of agriculture not only contribute to success in such undertakings, but they add greatly to the understanding and appreciation of nature in general.

Worthy home membership is developed not only through commercial farming activities, which are largely family undertakings, but through such leisure-time activities as those mentioned above in which all or several members of the family take part. It is also promoted by the contributions of successful farming to churches, schools, rural electrification, rural health, sanitation, and the like. Home membership is made more worthy by earning a good living. A really good living is necessary to support a life that is really worth while.

Possible contributions of agriculture to health and to ethical character are, no doubt, obvious enough to the reader who understands the value of diet and who knows that one's character is formed by the activities he engages in.

A comprehensive community program of agricultural education would involve providing classes in agriculture as a part of the general education of all high-school pupils or including agricultural materials in other courses taught by teachers

trained in agriculture. A fifth of our population is engaged in farming, and about another fifth is engaged in agricultural occupations related to farming. Agriculture provides many of the essentials of life for all people. The public prescribes many policies which affect the life of farm people and many agricultural policies which affect the lives of nonfarmers. Agriculture is interwoven with the rest of society. Those responsible for providing a program of general education adapted to our times should include a study of agriculture.

Units for General Agriculture. The objectives for vocational agriculture and the objectives for general agriculture are not the same; the courses do not have the same aim. Vocational agriculture is designed to train present and prospective farmers for proficiency in farming. Its objectives are *vocational* objectives, to make people proficient in farming as an occupation. General agriculture, on the other hand, deals with the agricultural areas of general education, the education which all people should have regardless of vocation. It is general in the sense that it should be common to all.

The units that should be included in high-school general agriculture depend on several things. They depend, in part, on how much time will be devoted to agriculture. The length of the course varies from one semester to two years (very seldom more than two), most courses being one year in length. The units may also depend on when the course is given, whether in an early high-school year or a later year or in both an early and a later year. It would seem that units dealing with agricultural economics and rural sociology should come in a later year. The courses should always meet the needs of those to be taught. They should not include units that are treated fully enough in other courses and should not repeat work done in agriculture in the elementary school. A course for girls only might not include the same units as a course for boys or a course for boys and girls. A course in an urban environment

might be shorter and might be quite different from a course in a rural environment. If two years or two semesters of general agriculture are to be given, the teacher should consider two groups of units. This would probably result in a better organization of subject matter and a course better adapted to the needs of the pupils.

Here are some units appropriate for general agriculture:

How plants grow
How crops are improved
Elementary principles of soils
Elementary forestry
Vegetable gardening
Growing small fruits
Growing tree fruits
Growing flowers
Home landscaping
How livestock are improved
Elementary principles of feeding livestock
Identification of breeds of farm animals
Identification of farm machinery
Identification of insects
Control of insects
Birds and their relation to agriculture
Relation to agriculture of snakes, toads, earthworms, and such animals
Shopwork
Providing farm-home conveniences
Poultry raising and keeping
History of agriculture
Importance of agriculture
Changes taking place in agriculture
Agricultural service agencies
The chief types of farming in the state, and why

Requirements for success in farming
Soil conservation
Contributions of science and research to agriculture
Contributions of agriculture to society
Relationships of town and country
Public agricultural policies
Cooperation in agriculture
Farmers' organizations

Suggestions for a Program of General Agriculture in the High School. The following suggestions are based on the meager literature available and the small amount of research that has been done on the teaching of general agriculture in the high school:

1. Teachers of general agriculture should be trained in agriculture. Perhaps at least twenty semester hours should be required in appropriate courses in agriculture, including agricultural economics, and twenty semester hours in selected courses in the supporting sciences such as economics, biology, botany, chemistry, and rural sociology. (Not just any courses in agriculture and the related sciences will give teachers the preparation they need. Adequate training is not a matter of mere number of credits.) It would be desirable, of course, if the teachers were college graduates in agriculture.

2. Only persons with farm experience or reared on the farm and interested in agriculture should teach general agriculture. Both farm experience and a desirable attitude are necessary to success in the teaching.

3. Enrollment in general agriculture should not be required of students.

4. Clear, valid teaching objectives to be attained by the course should be formulated.

5. No single textbook written for all the states should be relied on exclusively for the reading material. Extensive use

should be made of *up-to-date* state publications in bulletin, circular, and pamphlet form.

6. The school should provide a good agricultural library. The writer of this volume has examined many a library in schools purporting to be community schools, but he has yet to find (outside of schools with vocational departments) a creditable agricultural library in the school. When he has inquired into the reason for this, he has been told, "Our pupils don't have any problems in agriculture." In a study of the agricultural libraries in fifty-one Iowa schools in 1941–1942, an average of twelve volumes bearing seven different titles was found per school. Over two-thirds of the volumes were published at least sixteen years before the time of the study. Because of the rapid changes in agriculture, most of these books were of little value as sources of information on present-day problems and practices.

7. The method in teaching should make much use of interesting and worth-while learner activities rather than relying on teacher "telling" and catechistic recitations. Considerable use might well be made of field trips and class projects.

8. General agriculture should not be vocational. Details of agricultural operations in the production of crops and animals should be left for the vocational agriculture. Except for a few of such production units as are named in the preceding list, most of the emphasis can be placed on the development of appreciations and interests in agriculture and rural life.

9. In schools where a teacher of vocational agriculture must teach a nonvocational subject, general agriculture may be an appropriate subject for him to teach. In departments with more than one teacher of vocational agriculture it may be desirable that one of the teachers teach the general agriculture. A word of caution is in order here: A good teacher of vocational agriculture is not necessarily a good teacher of general agriculture; he may have little conception of general agriculture.

CHAPTER 14

EXTENSION TEACHING OF AGRICULTURE

All school teachers of agriculture should be familiar with the work of the Extension Service. Likewise, all persons engaged in extension teaching of agriculture should be familiar with what the schools do, or should do, in teaching agriculture. Extension is an educational enterprise. The people engaged in it must possess a good many abilities in common with teachers in schools. All teachers are directors of the learning process, and employ principles of sociology, psychology, and education. All teachers should be concerned with the total development and well-being of the persons they teach; all have a common goal. Teaching is a complex undertaking, requiring extended training in college. Thus, teaching agriculture, whether through the school or through some other agency, qualifies as a profession.

To understand the relationship between agricultural extension and agriculture in the schools, it is necessary to know how they developed together. Let us review, briefly, this development.

Development of Agricultural Extension and Agriculture in the Schools. The Morrill Act, or Land-grant College Act of 1862, resulted in the establishment of an agricultural college in each state. Apparently it was believed that these colleges would provide for the agricultural education of all the people who needed it. Such belief, if it existed, was ill founded. Almost immediately, people who could not go to the college for

courses were asking for its services. These outside services developed until they took a great deal of the time of the teaching force. In many states special extension staffs were sooner or later set up to render the off-campus service.

It was a quarter of a century after the Morrill Act before the Hatch Act was passed (in 1887), making appropriations for experimental and research work in agriculture. The experiment stations were founded to meet the need for experiment and research that had become so apparent—to find and discover truth in agriculture. Although there was a demand for off-campus service, extension work did not develop greatly for the simple reason that the colleges had little to extend. Reliable information on agriculture was exceedingly meager.

A little more than another quarter century rolled around before the Smith-Lever bill was enacted into law (in 1914), establishing the Extension Service as we know it today. As implied in a preceding statement, considerable agricultural extension work was done before 1914. A few departments of extension were created in the 1890's. By 1907, thirty-nine state colleges of agriculture were carrying on some form of extension work. In many instances this consisted of sending out free bulletins. These publications did not bring about the general adoption of improved practices.

The early "farm demonstration work" was the inspiration of the Smith-Lever bill. It created the demand for such legislation. Most of the congressmen from the South had seen successful work by county agents in those states, carried on under the Seaman A. Knapp plan. Some of the Northern congressmen had witnessed similar work, as the Office of Farm Management in the U.S. Department of Agriculture had used the demonstration plan in several Northern states. Congress had made appropriations to give aid to the work that Dr. Knapp was inaugurating. The first appropriation was made in 1904, specifying that the money was to be used for fighting the

boll weevil. As time went on, the language was gradually changed until provision was made for teaching and demonstrating better crop methods in general.

These three developments—colleges of agriculture, experiment stations, and agricultural extension—did not follow each other in easy and ready sequence. Much thought, discussion, and struggle intervened before they were written into the statutes of the nation.

Turning now to the development of agriculture in the high schools, the first high-school course in agriculture of which we have record was offered in 1821, the year of the birth of the American high school. There has been some teaching of agriculture, however sporadic, ever since that time. Not until several years of the twentieth century had passed were there many rural high schools. The first successful agricultural high school was established by the University of Minnesota in 1888. Several agricultural schools of secondary grade appeared in the next few years, including one at the University of Nebraska, one in each of the nine Congressional districts in Alabama, and the schools in Wisconsin, New Jersey, and Pennsylvania. Around 1900 a decided movement developed for teaching agriculture in the high schools. By 1909, about 500 schools were known as agricultural high schools. Many other high schools, public and private, offered courses in agriculture. Home projects have been used in teaching agriculture since 1908.

Agricultural clubs were developed, in and out of the schools, during the first decade of this century. The first boys' Corn Club was organized in Illinois in 1899.

It is clear that there was a definite development of agricultural extension and of vocational agriculture and other agriculture in the high schools before the Smith-Lever Act of 1914 and the Smith-Hughes Act of 1917. From 1908 on, legislation was before Congress authorizing Federal funds for

agricultural education. The early bills provided for both agricultural extension and agriculture in the schools. But difficulties were encountered in getting the legislation passed. So, in 1914, a part of the provisions of this legislation was split off and passed as the Smith-Lever Act, which provided funds for agricultural extension. In 1917 the remaining provisions were included in the Smith-Hughes Act, for the teaching of vocational agriculture in public schools below college level. Both laws provide for the matching of Federal funds by the states and local units.

Students of agricultural education should know that Senator Smith was senior author of the Smith-Lever Act and the Smith-Hughes Act. Both acts were supported by about the same people, passed by sessions of Congress having about the same personnel, and signed by the same President. The two acts were intended to supplement each other.

Administration of the Two Types of Work. Federal funds expended in the state for agricultural extension are made available by several acts of Congress, the Smith-Lever Act being only one of several. Extension work is carried on by a cooperative arrangement between the U.S. Department of Agriculture and the land-grant colleges in the states. In reality, extension is the educational activity of the agricultural college for persons not enrolled in a college curriculum. Extension Service is the name of one of a number of divisions in the U.S. Department of Agriculture. Extension employees working on approved projects in the states are given appointments by the U.S. Department of Agriculture, and usually by the land-grant college. Thus they are staff members of the college of agriculture. (The Federal appointment carries the franking privilege, permitting the free use of mails for official business, a fact sometimes not understood by school people.)

On the national level, extension work is administered by

the U.S. Department of Agriculture. In the state it is administered by the land-grant college of agriculture. In a majority of the states county agents are paid in part by the county, through some agency of county government or other organization. In the other states all the salaries are paid by the college extension service, using money from state and Federal sources.

Federal funds spent in the state for the teaching of vocational agriculture in the schools are likewise made available by several acts of Congress, the Smith-Hughes Act being only one of them. On the national level, vocational agriculture is administered by the U.S. Office of Education, which is a part of the Federal Security Agency. It has no connection with the U.S. Department of Agriculture. In the state, the vocational teaching is administered by the state department of education in the state capital. Teachers of vocational agriculture are employed by the local schools in the same manner that other teachers are employed, usually by a local board of education.

State Staffs. Each state has an extension director; most states have one or more assistant directors. District agents supervise the work in the field. Each state has one or more state supervisors of 4-H club work. All of these persons perform duties of an administrative or supervisory nature. There are also "extension specialists," who have three main functions in relation to the fields or subjects they represent: (1) aiding in determining the phases or practices suitable to be taught and in planning this work with the county agents and leaders, (2) aiding the agents in organizing and supervising the approved projects, (3) teaching the agents and leaders and teaching farm people directly.

Each state has a director of vocational education and one or more state supervisors of vocational education in agriculture. Many states also have district supervisors. The admin-

istration of the program is done by the state department of education. In each state there is a teacher-training staff. As a rule this staff gives teacher-training courses "on the campus" for undergraduate and graduate students; it also does "in-service" teacher training with the agriculture teachers employed in the state.

The Field and Functions of Extension Work. As we have seen, extension is one of the functions of the college of agriculture. Being a public institution, the college is interested in making its information available to all people and in getting its facts used. This is why the Extension Service developed. Agricultural extension includes work for boys and girls through the 4-H clubs, though most of its work is with adults. Club work is discussed in Chap. 9.

Extension work in agriculture is primarily an educational enterprise. Its objectives and ideals are those of education; the county agents and the extension specialists are teachers. Instruction is definitely provided by the acts of each state legislature in accepting the provisions of the Federal laws and in making appropriations for the work. One of the chief arguments in support of extension work has always been that it makes the results of the experiment stations effective by taking to the farmers the information that can be used in improving farm practices. It is poor economy to use public money for obtaining new information if that information fails to reach those who can use it or is too long delayed in reaching them.

Though it is generally conceded that the principal function of extension is an educational one, certain functions are performed that are noneducational. It is not always possible, of course, to distinguish between an educational and a noneducational activity. An educational activity is one that is carried on with the intent of securing learning. "Service" activities, on the other hand, which have to be performed over and over

for the same people are noneducational. County agents engage in some service activities. Not all such activities can be avoided. In importance, however, these should be placed after the educational activities. They represent what some people have referred to as the "errand-boy" activities.

The following statement on the purpose of extension work was written by Professor T. R. Bryant, professor of agricultural extension, University of Kentucky:

> The purpose of extension teaching in agriculture and home economics was to establish a branch of education for people not in college, that would take to them information, ideas, and suggestions that will encourage and help them to make farming more profitable, farm homes more comfortable, and rural communities more satisfying. It is intended to make sure that farm people in America shall never become peasants.

The County Agent and Extension Specialist as Teachers. The Smith-Lever Law says: "Cooperative agricultural extension work shall consist of the giving of instruction and practical demonstrations in agriculture . . . to persons not attending or resident in said Colleges in the several communities." Extension work was set up as an educational or teaching program.

Congressman Lever, in a speech before Congress while his bill for establishing the extension work was pending, said: "The plan proposed in this bill undertakes to do that [change methods of farmers] by personal contact . . . by going to his [the farmer's] farm . . . and demonstrating there that you have a method which surpasses his in results." It is usually, of course, physically impossible for a county agent to visit each farmer in his county. In an average Kentucky county, for example, there are 2,000 farmers; the average number of different farms visited per county in 1947 was 427, with 1.8 visits per farm. In the United States as a whole one out of

every three farms was visited. Considerable visitation is necessary to inspire the confidence of the farmers and to give those who visit them firsthand contact with farmers' problems in their true-to-life setting.

Since the county agent with 2,000 farmers cannot visit each farm often enough, he must work through leaders and through organized groups most of the time. He must hold meetings and must conduct tours of inspection to farms where demonstrations are in progress under his direction. A part of his job is to select and guide local leaders, help in planning and organizing county programs, and direct the activities of extension specialists in the county. Perhaps the average county agent finds it necessary to spend as many days in his office as he spends in the field. Thus the days for teaching outside the office are limited, for the year contains only 275 days exclusive of Sundays, holidays, and vacations.

Extension teaching is a special field, having several characteristics peculiar to it. A large number of persons per teacher is a significant fact in this special field of teaching. Also the people whom extension workers teach are not under compulsion to accept or learn what is being offered. They attend the meetings voluntarily. The audience consists of people with varying convictions, abilities, and amounts of information on the subject. All this makes it necessary for the extension worker to use great tact, judgment, and resourcefulness if he is to teach successfully. It also suggests that he be well trained technically, in the social sciences, and in education; that he have a farming background, and that he keep up to date in his field.

That the extension worker should use good method in his teaching goes without saying. He does not have the same pupil-teacher relationships as are found in the schools. Therefore the same types of teaching are not equally well suited to both. As a rule, extension teaching is more informal than

school teaching. In the early days the accepted method of extension teaching was by lectures. The lecture is not usually the most effective method of teaching, even when used by a specialist. So, finally it became common to supplement lectures with demonstrations of procedure or "how to do it"; result demonstrations to show the value of certain practices, etc.; concrete illustrations of points. Extension teachers now use demonstrations extensively, supplemented with charts, filmstrips, slides, and other forms of illustrative material.

When county agents and extension specialists meet smaller groups and have more frequent contacts with these groups, certain adaptations of problem solving, a group-teaching procedure, seem quite feasible to use. Problem solving is discussed in Chap. 5.

Regardless of the method in teaching, extension teachers should know what learnings they are attempting to bring about. These learnings will constitute the teaching objectives. Unless the teacher knows what learnings he seeks, he cannot teach; method becomes meaningless. Teaching objectives are discussed in Chap. 3.

As the extension worker represents the college, he should be a good teacher. He should also possess high standards of character and morals—which is self-evident; and his manners, speech, and English should be equal to that expected of workers in other professions. He must command the respect of all people. Many persons will judge his institution to a considerable extent by him.

Relationships with the Public Schools. Most colleges of agriculture have not had a very close relationship with the schools. Generally the state board of education assumes no responsibility for the college of agriculture. Such a situation, where it exists, is not conducive to a close relationship between the college and the public schools. Extension work, as already

discussed, is carried on in the state by the college of agriculture.

In the beginning, it was believed that the junior extension work would be closely coordinated with the work of the public schools. In a speech before Congress, Senator Lever said: "Your committee believes that the bill furnishes the machinery by which the farm boy and girl can be reached with real agricultural and home economics training through the country schools." However, certain disadvantages were encountered in the early attempts at cooperation with the schools, two of them being that the teachers were not in the communities during the summer when some of the most important activities of the year were taking place, and the schools were too academic in their viewpoint.

The most obvious public-school relationship of agricultural extension is with vocational agriculture. How the Federal legislation for these two types of work developed together has already been discussed. There is no question but that the acts were intended to be supplementary. Although the administrative setup is different for the two types of service, those who perform the service must live and work together. They have a common bond which must not be lost. All of them are trained, or should be trained, as educators. They are graduates of the same college of agriculture, have equally extended training, work in the same counties, with the same types of people who look upon agricultural education as a single undertaking. The responsibility of the agricultural college to these men does not cease with their graduation from the college.

Perhaps the first step in the establishment of a good relationship, where it does not already exist in this dual system of education, is to understand clearly that the Extension Service in the state is linked administratively with the college of agriculture, while vocational agriculture is the work of

the public schools. To the extent that the college of agriculture serves all people and all agencies who call on it for service, this difference in administration becomes unimportant. Almost uniformly workers in agricultural education are eager to receive assistance from the agricultural college. They are in position to help the college *extend* its teachings.

There are many worthy examples of cooperation between these two agencies. In hundreds of communities extension workers have done much to establish departments of vocational agriculture. In many counties all the different agricultural agencies plan their programs together. In several states the extension specialists have worked a great deal with the teachers of agriculture in bringing them up-to-date information in special phases of agriculture, and with the teacher-training departments in preparing teaching materials. They have appeared frequently on state-conference programs of teachers of agriculture. Teachers, teacher trainers, and supervisors in vocational agriculture need the assistance of extension specialists. Most states have been rather liberal in supplying departments of vocational agriculture with bulletins, circulars, and booklets to use in teaching, even when paid for out of extension funds.

It would be helpful in promoting good relationships and in avoiding duplication of effort, if the workers in both fields of work are clear on certain differences in the two programs as well as the differences in the administrative setups. Some of the differences in the two programs are:

1. Extension procedures are designed to reach large numbers of people with relatively few professional workers. Extension people hold group meetings but do not give organized courses, in the usual sense of the term.

2. The work of vocational agriculture is limited to the educational. Agriculture teachers work more intensively with the people they reach, giving courses and supervising the

practices of the class members in the patronage areas of the schools—usually relatively small communities.

3. Extension is more concerned than the schools in getting the new information to all people for immediate use. Schools, while concerned with the immediate use of the learning, are more concerned with developing abilities to be used the rest of one's life.

CHAPTER 15

COLLEGE TEACHING OF AGRICULTURE

Much fault has been found with college teaching in recent years. Many of the critics have overlooked a great deal that is good, some of them not even recognizing that the college has produced the able critics. While there is much good college teaching of agriculture, perhaps it should be conceded that the teaching generally has not advanced as rapidly as the science of agriculture. The college teacher, being a scholar, is moved to a serious study of his subject field. It would seem that he should be both willing and able to make a serious study of the function which gives him his name. To the extent that college professors organize and present their subjects according to the logic of their scholarly interest, indifferent to guiding learning toward justifiable defined ends, and ignoring both the science and the art of teaching, they deserve the unfavorable criticism they receive.

The three main functions of the college of agriculture are resident teaching, extension service (largely teaching), and research. No attempt is made here to rank these functions as to importance. However, the giving of instruction to students coming to the institution was the earliest responsibility of the college. Considering the vocations followed by the students when they leave college, many people feel that resident teaching is the most important function of a college of agriculture. This chapter is devoted to resident teaching. The three functions of the college call for different types of

workers. The professor who teaches college students has a profession all his own, and may not be suited to perform either of the other two functions.

Some Things That Hinder Improvement in Teaching. College teaching in agriculture is, or should be, a profession. The preparation of people to enter this profession has been, strangely enough, almost wholly overlooked. Very little has been done to provide special training for college teachers. The first professional schools of all kinds–medicine, law, engineering, etc.–were manned chiefly by practitioners who gave a part of their time to teaching. While there was some good teaching, no doubt, success in teaching could not be counted on nor accounted for. Professional schools have always been handicapped by the traditional belief that "anyone who knows his subject can teach it." However fallacious the implication of this statement that has so dominated the pedagogy of higher education, as long as the theory governs practice there can be little hope for the improvement of instruction.

College teachers of agriculture are often selected without considering their ability to teach. After being selected, it is not the common practice to give them any supervision in their teaching. Too often, they are not encouraged to do good teaching or to give attention to the problems of teaching. A frequent practice is to select young men who have made high grades in college and to make them assistant instructors or full instructors (short of assistant professor in rank). They may begin teaching without any instruction in the learning process, philosophy of education, or method in teaching. They are judged by the research and publication they do, while the quality of their teaching is ignored. If they show enough aptitude in research, they are retained as instructors. This practice of rewarding research and publication without rewarding teaching tends to create an indifferent attitude to-

ward teaching on the part of the college personnel. It handicaps the improvement of instruction.

Removing the Handicaps. The trend is toward good teaching method. Many colleges of agriculture deliberately encourage good teaching. There should be no lessening of emphasis on the technical knowledge of the college teacher of agriculture. At the same time, those who employ the college teachers should realize that the chief purpose of a great majority of its students is preparation for a vocation. The kind of vocation entered by many more college graduates than any other one kind is that of teaching (which includes extension teaching, teaching vocational agriculture, college teaching). The first requisite of a good teacher of those preparing for a vocation is a mastery of the vocation for which the students are in training. This being true, most of the college teachers should be chosen from the ranks of teachers of agriculture (vocational, extension, etc.), rather than from graduate students who have not engaged in a teaching vocation and who lack maturity and teaching experience. Men chosen from the ranks may be short on the technical knowledge needed for college teaching of agriculture, but they can acquire this if given the opportunity.

The second requisite of a good teacher is skill in teaching. Both the technical knowledge needed for college teaching and the skill in teaching come from long and effective study and successful experience. Hence it would seem to be self-evident and generally accepted that a high-grade teacher in a college of agriculture is well trained in agriculture, has had enough experience in the vocation for which he prepares his students to demonstrate his ability, and is specially trained in teaching (before and after becoming a college teacher).

Apparently, college teaching is in a healthful state of unrest. Much of the criticism against it comes from within. There is real concern about developing more effective pro-

grams of instruction. College teaching is removing its handicaps, giving teaching the recognition it deserves, and coming into its own as a profession.

Teaching Objectives. Teaching on the college level as on any other level is the direct guidance of learning to desired ends. The greatest single weakness to be found in teaching is lack of clear, worth-while, justifiable teaching objectives on the part of the teachers. College teaching is done by the teachers—not by the dean as a dean, not by the president, nor by the library, nor the laboratory. These, of course, may render a service to teaching in providing conditions under which learning can take place. Teaching implies a pursuit of learning by the students that is not self-directed. Obviously, if students knew what to learn, and could and would direct their own learning economically, teachers would not be necessary. Most college students need teachers. The college is avowedly a teaching institution. Only when the teachers know what the students ought to learn can they resort to teaching with any assurance that they are doing the right thing. Without such knowledge, as well founded as it may be, attempts to teach are likely to waste the students' time and may do a great deal of harm.

Every teacher should know, as definitely as possible, what learnings he should try to secure. These are his teaching objectives. (Teaching objectives are discussed in Chap. 3.) Teachers do not have teaching objectives if they have only outlined their course or listed the topics or units or jobs to be covered. Teaching objectives represent changes that are to be brought about in the learners. Without teaching objectives, a teacher cannot teach. Whatever he does will be something other than teaching.

Method in Teaching. Good teaching is always good teaching no matter at what level. While the techniques may be different on the different levels, the same principles of teaching-learning

operate. The college teacher of agriculture should know that learning is a self-active process, that practice is essential to learning; he should make much use of the principle of effect and see that the desired experiences of the learner occur together; he should realize the great importance of generalization in teaching agriculture and be able to secure the generalization; he should know that meanings for the student come only from the student's experience; he should understand the nature of observation and of habit formation; and he should be aware of the necessity for worth-while goals on the part of the learners and for their having a knowledge of their success and error as they try to reach those goals. (All of these things are outlined in Chap. 2.)

Lecturing. Although the lecture has a place in promoting learning in college, the teacher frequently lectures when some other technique would be more effective. The lecturer (as such) assumes no responsibility, as the true teacher does, for the learning by the student. He serves only as does the library or a book, to offer what the student may possibly use. The man who lectures a great deal is likely to violate most of the principles named in the preceding paragraph, beginning with the first one—that learning is a self-active process. He, too often, is guilty of believing that he has *taught* when he has *presented* his lecture.

These statements are not intended to condemn lecturing. A straightforward presentation, whether called a lecture or not, may be the best way of getting certain material before a class. Obviously, the class members should have a background of knowledge and experience which will enable them to profit by the presentation; the symbols used (words, etc.) should be symbols already bound with meanings that the students possess. The exposition will gain in effectiveness by the problem approach—by the raising of questions to be answered or meeting difficulties to be removed by the exposition.

As a rule, what is presented in the lecture should be used soon by the students, with the teacher checking on the use or application. Certain applications, of course, may be made by the teacher as a part of the presentation, but additional or confirming application by the students is nearly always necessary in good teaching. Great care must be taken in lecturing, if anything more than passive learning is to be secured on the part of most students.

Laboratory Work. Laboratory work may offer opportunities for effective teaching. The teacher does not always capitalize on these opportunities. Although involving self-activity, laboratory work may be done in such a manner as to be unproductive of learning. The factor of interest is exceedingly important in laboratory work, as elsewhere in learning. Some of the things that make for true-to-life interest (as contrasted with working for a grade or credit) are well known. Interest in an activity is always strongest when the result sought seems important to one because of its reference to his own wants and desires. When students' efforts result in products recognized and desired by them, they are interested. For example, farm-shop laboratory is likely to be interesting because the products are recognizable, especially interesting if the students desire to possess the abilities and have evidence that they are acquiring them. Interest can be created and held, even in activities that are primarily ideational, when the activities enable the students to answer questions which they seek to answer rather than merely fill in a notebook. Such might be the case in examining a grasshopper or in preparing cultures of bacteria. Interest tends to be highest when the process is meaningful. As a rule, it is not interesting to follow prescriptions in a laboratory manual if the student does not know why he is doing what he is doing or whither he is bound. If possible the student should understand why the acts which he is called on to perform are significant. Otherwise, the

laboratory work is likely to descend to the level of dead routine and become a chore for the student.

The teacher must be very clear on why he is using the laboratory in his teaching, if the laboratory work is to yield the best results. He may, for example, wish to use the laboratory to provide the firsthand experience necessary to the concepts he desires to teach. Thus he may be using the laboratory because verbal stimuli cannot be depended on. The teacher would then plan the laboratory work to accomplish this result. A teacher may use the laboratory in order to develop certain manipulative skills, as discussed in Chap. 6. For example, students must shear sheep if they are to acquire this manipulative ability. The teacher, of course, should be able to justify the skills that the student is to learn. It is doubtful, for example, if the learning of much "laboratory technique" can be justified for students who are not to become laboratory technicians. But whatever the manipulative skills to be learned, the teacher should conduct his laboratory work so as to get them learned. In developing such skills, he will see that the students' initial performance is as correct as it may very well be, that errors are not practiced. If the teacher is not concerned with teaching manipulative skills, quality of performance may be relatively unimportant. Always, the teacher's objectives condition how he shall go about attaining them.

In teaching facts or principles by using apparatus or equipment, teachers should consider the possibility of using demonstrations rather than having each student perform the exercise in the laboratory. The demonstration usually saves time and materials, is more accurate, and often more interesting than individual laboratory work, and results in more learning. For other statements on this point, see page 145.

Problem Solving. Most good college teachers use some form of problem solving in their teaching. Adapting problem solving to various groups, including college classes, is discussed on

pages 132 to 134. To the extent that teachers guide students in attacking problems real and worth while to them, the students engage in purposive activity at a high level of intensity. His teaching is then on an infinitely higher plane than when the students are studying topics or just reading certain bulletins or chapters in books. (Chapter 5 is devoted to the use of problems in teaching.)

Practice and Theory. Perennial problems with which the agriculture college is confronted are the making of provisions for the teaching of practical skills and the proper relating of practice and theory. Often certain members of the faculty regard the teaching of manipulative skills as beneath the dignity of the college, in spite of the fact that the graduates must possess a reasonable number of these skills if they are to succeed in their work after leaving school. When the college considers itself primarily a vocational school, this problem solves itself; the significant manipulative skills are then taught because they are not already possessed by the students and are necessary to vocational success.

Most of the theory to be taught in college should contribute to the understanding of the doing (which is not limited to manipulative doing). Both the social and the economic worth of man depend upon his doings. His doings in turn may depend heavily on the understanding or theory behind them.

It is possible in teaching to be too preoccupied with matters of use and application. As John Dewey has said, one should not "tether one's thoughts to the post of use with too short a rope." The good teacher will avoid this error—he will lead his students into a study of what they deal with; he will make use of the natural tendency to find satisfaction in understanding, in mental mastery; he will develop in the students an interest in intellectual matters that have only an indirect connection with the original practical activity or thing; he will

fan the spark of curiosity, which is still alive in most college students. The everlasting "why" is the prime source for interest in theory. But the teacher will not tap that resource if he attempts to develop a background of theory before the students have met something that needs explanation, before questions have been raised that need answering. For the student the theory is then empty; he is not likely to be interested in it; there is little or no curiosity to be satisfied. Attempting to teach the theory before there is a "foreground" is likely to result in more or less rote memorization of the statements made and a failure of the theory to function when practice is later undertaken.

The teacher should begin with activities that have direct interest rather than with theory. From these he can go into matters that have an indirect and intellectual or theoretical connection. For example, the direct interest in feeding farm animals should pass into an interest in the functions and use of nutrients by the animals. The direct interest in producing clean milk should grow into an interest in understanding bacteria—what they are, what they do, how they reproduce, etc.

Grant, if we may, that on the college level it is very important to develop intellectual grasp and power. However, such grasp and power are not developed by the separation of practice and theory. Theory that is not associated with practice in the learning is not likely to be learned in a functional manner; it is not likely to increase one's ability in doing, to deal with true-to-life situations.

Correlation of Courses. Correlation of courses is closely related to the problem of relating practice and theory. One aspect of the lack of correlation reveals itself in the teaching of principles basic to certain courses in agriculture at such time and in such a way that the relationship will be seen by the student when he comes to the agriculture courses. The

problem arises especially in the teaching of the sciences that contribute to agriculture—chemistry, botany, zoology, biology, bacteriology, physics, geology, economics, etc. Aside from attempts to teach principles before the students have a reason for learning them, often the science courses are offered without reference to any use that the student is to make of them. The result is that whatever is learned (if indeed it is learned) is not usable by the student when he reaches the courses for which his study of science is supposed to be a preparation. The problem, of course, is not peculiar to agriculture and the sciences basic to it. It is found in education with respect to psychology or educational psychology, and in other professional schools.

The problem is an old one. In one respect it is becoming more important that the problem in agriculture be solved—there is an increasing need for using directly the basic sciences in the vocations the students will follow. Chemistry, bacteriology, entomology, and the like are being used more and more in the agricultural practices. They cannot be used by people who have not learned them in relation to practice.

CHAPTER 16

EVALUATION OF STUDENT GROWTH AND OF TEACHING

Teaching is, or should be, evaluated by evaluating the learning that takes place as a result of the teaching. This indirect way of measuring teaching is the only valid way possible. Teaching takes place only when learning takes place.

In previous chapters the necessity for having teaching objectives has been stressed. What the teacher holds and intends to be the outcomes of his instruction are his objectives to be achieved. As such, they determine not only *what* he teaches, but *how* he teaches it, and how he measures and evaluates the results of his teaching. A teacher cannot intelligently continue to formulate his teaching objectives, plan his teaching procedure, and select his teaching materials without evaluating the learning secured. He cannot direct his teaching emphasis toward overcoming learning difficulties unless he knows that they exist and where they exist. Nor can the student know whether he has attained his learning objectives or where the gaps in his learning may be, without in some way his learning being evaluated. If the teacher is to guide the student, he must be able to find out what the student has learned, what he has failed to learn but needs, and perhaps the difficulties that have prevented learning. The teacher who measures and evaluates the learning secured is almost sure to become clearer as to his teaching objectives as time goes on—what their attainment includes and involves—and his instruction is likely to improve thereby.

Learning represents changes in behavior. The changes sought by the teacher are, of course, his teaching objectives. The most satisfactory test or measure of learning, from the standpoint of promoting learning, is one that shows the degree to which the objectives are being attained and wherein they are not being attained. Such a measure gives evidence of the progress of the students; it reveals the extent to which the intended changes in behavior are brought about; it should give evidence of the progress each student is making in terms of goals appropriate for him. The major role of measurement is not that of determining at the end of an educational process what learning has taken place, although that may be important, but rather to discover at the beginning what learning exists, and at various points throughout the progress being made.

Manifestly, evidence of desirable behavior changes in students is not limited to paper-and-pencil tests. The evidence should be valid and respected by the students as valid. If a paper-and-pencil test will supply such evidence, well and good. Some attainments can be determined by such a test, but many cannot be. Most manipulative abilities cannot be; observation of performance or checking of outcome, or both, are usually necessary. The host of abilities that are not verbal abilities are likely to be poorly measured by paper-and-pencil tests. Most attitudes are difficult to measure by such tests. More will be written about this later.

Further Relation between Objectives and Evaluation. Because of the importance of evaluating learning in such a way as to have evidence of the degree to which the objectives are being attained, an essential step in evaluating learning is to formulate clearly, understandably, and objectively the important teaching objectives. Only then can ways be devised to appraise the attainment of the objectives; only then can the measures be checked against the objectives. The objectives should serve

as guides to setting up the measurements. When objectives are vague and nebulous, they cannot do this. Each objective should make as clear as possible the kind of behavior to be developed in the students. If the objectives do not represent points to be reached by all or nearly all students, they should at least represent directions in which the students are to progress, each student to reach a goal appropriate for him.

The student should not only know what he is trying to learn, or at least trying to do, but he should know where he is succeeding and where he is failing. Only then can knowledge of progress or knowledge of success and error operate. Without such knowledge, practice or effort is futile. It is only when the student has a learning objective that failure to learn is likely to stand out for him as failure to learn or a *weakness to be remedied*. Otherwise his failure to learn is likely to be considered as a lowering of his grade that cannot be remedied.

Relation of Measurement and Evaluation to Motivation. Where evaluation supplies the student with evidence of desired achievement, it may be genuinely motivating. Of course, information as to results or knowledge of progress can have true meaning for a student only with reference to what he wants to do or attain.

In evaluating teaching-learning, the teacher should carefully consider what he hopes to accomplish by the evaluation, for the students are influenced by the kind of evaluation used. If the teacher hopes to get the students to study in order to keep from "failing the course," he may possibly succeed in doing that. If his motive is to promote effective learning, his measurement of learning should be for that purpose. Apparently, evaluation done for this purpose should be distinctly separated from grading or marking the student; the student should know that the evaluating is being done for him, that what is revealed will be for *his* benefit, that the findings will not be used against him in marks or passing or honors or

eligibility or in any other way. The student should always feel that what he is doing is significant, that it ought to be done. He should see evaluation as a means of determining where he now is with reference to his desired goals. It is possible to evaluate learning in such a way that the students will look upon evaluation as interesting and helpful to their learning.

Doing the Measuring and Evaluating. Evaluation of teaching-learning is a complex undertaking. But it is so important that we should be willing to spend the time and energy necessary to do a good job of it. From the standpoint of improving teaching, which is to increase the amount and quality of learning, there is probably nothing quite so important as evaluating the learning that results from the teaching.

In evaluating teaching in agriculture, agricultural objectives and educational objectives must not be confused. They are different. An agricultural objective has to do with the improvement of agriculture—crops, livestock, soils, and the like. An educational objective has to do with desirable changes in people. It is often possible to achieve an agricultural objective without any learning taking place. Of course, teachers of agriculture wish to improve agriculture. Improvements in agriculture may be evidences of changes in the learners, but not necessarily. The improvements may have been brought about directly by the teacher (not through his teaching) or by the parents of the students or they may have been induced by various extraneous stimuli and not continue as improvements when whatever induced them is withdrawn. Changes in people, on the other hand, have the characteristic of persisting when the individuals are on their own.

Obviously, what the teacher should like to evaluate is progress toward the attainment of his educational objectives. This much he knows: In the absence of changes in agriculture, there has been no change in student behavior, no teach-

ing. Often the teacher must evaluate as best he can *before* the students are free to act on their own (without the operation of extraneous stimuli). He will attempt to teach in such a way as to bring about changes in the learners that will result in changes in agriculture. He will be wise if he does a good deal of his evaluating in terms of changes in agricultural practices, being as sure as he can that the changes in agriculture have been brought about through the changes in the learners. This should not interfere with his central emphasis being on student growth rather than on changes in farming practices.

Evaluating Manipulative Abilities. Perhaps manipulative skills are more easily measured objectively than any of the other learnings. Often speed and accuracy of processes can be compared with standards of appropriate speed and accuracy. Also the material product can be compared with the product of a competent producer of that kind of product. Performance, speed, accuracy, and the material product all lend themselves to objective measurement. Although manipulative skills may be more easily measured than other forms of learning, usually the methods of measurement are no more convenient than traditional tests and examinations used for measuring knowledge. No genuine test of manipulative skills can be made by an oral or written examination.

It is an error to assume that manipulative abilities are possessed by students in proportion to the information acquired that may be related to the skills. Information revealed in a recitation or examination may not be an index of manipulative skills. For example, there may be little or no relation between information scores on culling hens and the students' ability to cull hens. (In an experiment at The Ohio State University no relation was found.) However, the performance of a skill is sometimes a good test of certain background information. The teacher should not call for special facts related to a manipulative skill when students have amply demonstrated

their proficiency in the use of the facts by performing the skill. To be able to use the facts is a much better test of really possessing them than a paper-and-pencil test can be. If the students can use the facts in performing the skill, they need not necessarily attempt to state or to remember and put on paper the knowledge involved in the procedure. In some instances attempts to do so interfere with functional learning.

Evaluating Information or Knowledge. The teacher should be more concerned with how the students can *use* the facts and principles than with their ability to state them or recognize them in a list. (This is not to say that students should never state facts or principles.) If a fact or principle is taught with the idea that it will serve to determine what the student does in a certain type of situation in agriculture, then the proper test is to have the student meet such a situation and see how he uses the fact or principle in meeting it.

Measurement should not be limited to information. If measurement is limited to information, it is limited to only a part of the justifiable objectives, and so the danger of distorting the course and perhaps of deceiving the student as to his accomplishments.

Evaluating Managerial Abilities. Knowledges and manipulative abilities are easier to measure and evaluate than are managerial abilities. Ability to manage, competency in making decisions where several variable factors are involved, are needed by farm operators. Management is made up of several abilities. These abilities are developed through meeting and solving managerial problems. The test of a managerial ability is how well the student can meet and solve the problems. Such an ability, like any other large and complex ability, must be broken down into smaller abilities in assessing student growth. The teacher can only be as objective as possible; for the rest of the evaluation he must rely on subjective means. He can judge the clarity with which the student formulates

his own managerial problems, his ability to see the significant factors that bear on the problems, the relative emphasis he gives to the several factors, and the quality of his decisions. Farm managers need to be able to solve such problems as these: How should the size of this farm business be increased? How much can I safely pay for this farm? If the student himself has no such decision to make now, the teacher can provide situations for making the kind of decisions he will later have to make and judge his ability to make the decisions.

Evaluating Attitudes. The development of attitudes is an important part of teaching, as discussed in Chap. 7. Attitudes are the most intangible of all learnings, therefore the most difficult to measure and evaluate. In school the student usually tries to display the attitudes which he thinks will please the teacher. But by closely observing the behavior of the student in situations where the attitude is a factor, the teacher will be able to discover much that will indicate the student's attitude. Attitudes are large determiners of behavior. For example, a student's attitude toward swine sanitation will have a great influence on what he will do about sanitation with his hogs, conceivably as much as all the rest of his sanitation learning.

Most of the difficulty in evaluating attitudes arises from the lack of clear, definite, specific teaching objectives on them. Hazy objectives in any kind of learning will make it hard, if not impossible, to evaluate their attainment. This is as true of abilities as of attitudes.

Testing as a Part of Teaching. Testing or evaluation is an integral part of good teaching. Teaching consists very largely of evaluating or testing the learning of the students and directing their activities so as to carry the learning forward to meet the needs revealed by the evaluation. It is desirable, if not an absolute necessity, to ascertain the student's progress in acquiring all the specific learnings that the teacher would teach.

This brings up the question of when the evaluating or testing should be done. It is too late when the course is over; there is then no opportunity to direct the learning activities in the light of the needs revealed. Testing should be a continuous process. The teacher should check up on the attainment of each fairly large teaching objective before going on to new material. For example, if he has been trying to develop the effective ability to feed hogs, his attainment and that of the students should be evaluated before leaving the objective.

It is not enough that the measurement reveal to the student that he is lacking in the learning as a whole. It should reveal where the shortcomings are and where the learning is sufficient for the purpose. Only then can the weakness in the learning be remedied in a manner economical of time and energy. An ideal scheme of measurement would indicate the status of any given student at any time in any given learning, compared with the standard of proficiency which is the teaching objective.

Improving Evaluation. Doing the following things should improve the measurement and evaluation of student growth and of teaching: (1) Use measurement as an integral part of the teaching, as a rule, and justify it to the extent that it promotes learning. (2) State the teaching objectives in such terms, when possible, that their attainment can be known. (3) Attempt to measure only that which can be measured. Not all desirable learning outcomes are measurable. (4) Use subjective measurement without apology when objective measurement cannot be used, but regard it as subjective. (5) Realize that exact measurement is not usually necessary for practical purposes, even if it were possible. (6) Do not attempt to measure every bit of learning; valid sampling will serve the purpose. (7) Use the results of evaluation or measurement to promote learning and to improve the teaching practices.

That evaluation is not always well carried out is conceded.

The following material should be suggestive to the teacher, school, or community that desires to improve its procedures in evaluation. (Most of the statements are from a discussion by Dr. H. M. Hamlin, in *Agricultural Education in Community Schools.*) [1]

There are two clear steps in evaluation:

1. Setting up "evaluative criteria" or evidences of progress toward each of the objectives
2. Choosing or developing devices for applying these criteria

Let us illustrate the process of setting up evaluative criteria. We shall assume that the objective is the ability to produce pork. (Qualifying adverbs might be added, such as "efficiently" or "economically," and such adjectives as "high-quality" might describe the kind of pork to be produced, but it seems best that the statement of an objective be simple.) The ends sought are made clearer by the evaluative criteria which are listed for an objective.

Evaluative criteria such as the following might be selected:

1. Pounds of pork per sow (litter weight at 180 days)
2. Pigs farrowed per litter
3. Pigs per litter raised to weaning
4. Average weight of pigs at 56 or 180 days
5. Pounds of feed per 100 pounds gain

A really good pork producer would be expected to possess certain fundamental knowledge, which could be tested in a written examination or otherwise. He would be expected to have certain interests and ideals, such as:

[1] H. M. Hamlin, *Agricultural Education in Community Schools,* The Interstate, Danville, Ill.

1. An interest in the literature on pork production, evidenced by his securing, reading, and discussing available materials
2. A desire to reach or exceed accepted standards of efficient pork production
3. An interest in studying his individual animals and noting their reaction to the treatment given them
4. A desire to work cooperatively with other pork producers whenever cooperative activity is needed

Perhaps more important than anything else would be his ability to deal independently with problems and emergencies, an evidence of his ability to think in the field of pork production.

The list of criteria might be extended indefinitely. However, a long list is not needed for an evaluation but only a fair sampling of the important criteria that might be applied.

The second step in evaluating is choosing or developing devices for applying the criteria. Such devices as these have been developed:

1. Records of supervised-practice accomplishments
2. Studies to determine occupational success after school days are over
3. Surveys of results, practices, opinions, and attitudes
4. Tests (paper-and-pencil, performance standardized)
5. Rating scales and systems (including the evaluation plan of the Committee on Standards, of the American Vocational Association)
6. Observation of daily work in class, shop, and elsewhere
7. Interviews and observations, particularly observations of voluntary activities
8. Written work (project plans, farming-program records, notebooks, papers)

9. Anecdotal records (records of behavior or expressions which make possible insight into the individual's real motives and attitudes)

When understandable objectives and criteria such as these are used, much of the evaluation can be self-evaluation. The end to be sought is a person capable of evaluating his own educational progress.

More Measurement and Evaluation in the Future. In the future we shall need more, not less, measurement and appraisal of learning. We shall need to use many means for obtaining evidence of change in behavior. We shall need this evidence in relation to all large objectives and the total development of the student. We shall need to secure evidence of behavior under the many conditions in which we expect it to function, not just under schoolroom conditions and in supervised situations. The evidence must not be so scattered and fragmentary as to seem unimportant, and it must be interpreted. The evidence must be used in promoting desirable learning. All of this calls for some system of collecting and recording the evidence. The process of evaluation is and will become more clearly recognized as an integral part of the educational process.

CHAPTER 17

TEACHING AGRICULTURE AS A PROFESSION

"And gladly wolde he lerne, and gladly teche." No one should be a teacher of agriculture who does not gladly learn and who does not get satisfaction in stimulating others to learn. Study should be a dominating phase of a teacher's life. Unless one delights in study—delights in books and other reading materials—he should not enter teaching as a profession. A school teacher of agriculture must do his work in the atmosphere of the school and the library, on the one hand, and of the community and the farming vocations, on the other. Both of these aspects of his work should appeal to him. If one of them is distasteful, he should not teach agriculture.

Teaching is a profession. It is one of the vocations (or groups of vocations) that require extended college training—years of special preparation. Long school training is a characteristic of a profession that sets it apart from other vocations. Medicine, law, and engineering are professions, among the many. The noun "profession" should not be confused with the adjective "professional." Professional simply means that the person is not an amateur, as for example, the professional baseball player. Only one male person in twenty-six in the United States follows a profession. He who would enter a profession should expect to prepare himself for it and should plan to grow professionally. These things he must do if he is to have the confidence of his constituents and the respect of his fellow workers.

Agriculture, homemaking, and education are the three great groups of vocations in which all people are concerned. No other vocations are so fundamental to human welfare. Agriculture supplies the primary physical needs of man; the home is the basic unit upon which the strength of the whole social structure depends; education makes possible the advance of civilization by freeing man to do things beyond those necessary for a bare existence. The public, in a general way at least, not only realizes the importance of agriculture and of the home, but it has great faith in education. This faith is evidenced by the public school system supported at public expense and extending from the kindergarten to the most advanced instruction in the graduate schools. Considering all of these facts, it would seem that teaching agriculture is a very significant vocation.

Contribution of a Good Teacher. No one can measure the contribution of a good teacher. The few excellent teachers you and I have had did something for us which we prize beyond any material possession. We are different because we had such teachers. Most of us know very well who those good teachers were. Society could not possibly have paid them a salary that would represent the worth of their services. Although it is not possible to place a monetary value on a teacher's work, partly because so much of his services are of an intangible nature, the following statements, made by Dr. W. H. Lancelot of Iowa State College several years ago, are challenging to a teacher of agriculture:

> In nearly any Iowa community an effective teacher of vocational agriculture can, within a period of three or four years, reduce the cost of producing pork by approximately $1.00 per hundred; increase the average yield of butterfat per cow by 50 pounds or more; diminish the cost of producing corn by at least 10 percent; or increase the production of eggs per hen by from forty to sixty. The value of these four results alone for the aver-

age Iowa community would amount to more than $100,000. Yet there are others that would increase the total greatly.

These improvements are cumulative; they will go on year after year after the teaching is done. A good teacher of agriculture will be able to secure economic results great enough to pay his salary from ten to thirty times or even more. Thus he can justify his existence in the world and feel that his work is worth while.

Our discussion on the contribution of a good teacher must not end with this economic note. What one teaches in the field of earning a living is highly important in agriculture, but to stop at this level is to fall short of the contribution of a real teacher. The beloved and masterful teacher is remembered long by those fortunate enough to be in his classes. Even if he himself should be forgotten, some of his teachings remain to influence the lives of his students; he leaves a lasting impress.

Acquiring the Ability to Teach Well. Skill in teaching is the teacher's basic skill. Without it one is not a good teacher. The teacher who does not teach well is in a class with bunglers in any other field; he bungles the job.

Teachers are born and then made teachers. People are not born with ability to teach any more than they are born with ability to spell, calculate percentage, or play the piano. All such abilities must be acquired through learning. Of course, not all persons can acquire the abilities with equal ease; and a few persons are not able to acquire them at all. However, the capacity for teaching seems to be quite widely distributed; most people can acquire the ability if they are willing to put forth the necessary effort in a reasonably intelligent manner.

One grows to be a good teacher through effort. Every good teacher has searched long and patiently for ways of improving his teaching. In becoming skilled, he has spent many

hours in practice—often painful practice. He is interested in teaching and has a great desire to become a superior teacher, and he has sought to understand the principles of learning and teaching. He has paid the price for the skill he possesses. It is doubtful if one becomes a good teacher or remains a good teacher if he does not enjoy teaching. Only satisfaction in teaching will sustain the effort, which must never waver or slacken.

The Abundant Life. The primary aim of all education is to increase the quality of "the abundant life" for the individual. The agriculture teacher should live a rich life. A few years ago Dr. A. K. Getman of New York state, in an article on "The Art of Living," said, "It is my view that the teacher's chief means of guiding and instructing youth in the art of living is the depth and quality of his own life experiences and his ability to inspire youth through his own example." He who has not mastered the fundamental elements in the art of living cannot inspire others to do so.

Obviously, the abundant life consists of more than having consumption goods, important as these are. One must have some time for leisure and avocational pursuits—for education, recreation, one's family, artistic expression, individual study. The abundant life calls for a deep understanding of the breadth and quality of life's problems, which is not a subject of scientific proof. To have such understanding, one must have a source of spiritual resources; he must have a belief in values and a faith in the "unseen." What the teacher is, is vitally important to his teaching. What he is, cannot be separated from his life.

Selection of Those Who Are to Become Teachers. There should be careful selection of those who are to enter teaching. Teacher-training programs in agriculture are too costly to carry those persons who for any reason are unsuited to become teachers, if it can be known who these persons are.

It is not undemocratic to refuse entrance to such persons. Rather, it is undemocratic to permit persons to enter a vocation for which they are not suited; they are thereby denied the opportunity of success. It is unfair, not only to the person immediately concerned, but to the teacher-training division or department, to the pupils he will teach while in training, and to society, to give teacher training to those who lack the qualities necessary for successful teaching.

Selective means are well on the way to being worked out. Teacher-training departments should no longer rely just on the grades of the students in previous courses and the number of years of farm experience. Personality, ability to deal with others, regard for teaching, conflicting habits and attitudes, teaching aptitude, and other things need to be considered. The problem of selection is not a simple one.

Teachers Should Be Charming. The teacher should enjoy both the privilege and the capacity to be himself. Literature and other art have portrayed the teacher with "teacherish" and "vinegarish" features. Apparently many teachers become suppressed with the solemnity that education so readily assumes. As a profession, education is too often guilty of a heavy pose, a dignified pretense, an affected culture.

There is no good reason why a teacher should not be dynamically alive, why he should not cultivate a charming personality. A teacher does not need to *seem to be a school teacher*. One who is charming, is charming without respect to his vocation. Charming people are interested in other people's opinions, they listen when other people talk, they know and like human beings cultured or not, they feel the fundamental values of life, they are happy, they are not sorry for themselves, they are not sarcastic, they are not always correcting or teaching somebody. Charm, of course, is not a conglomeration of traits. While traits as such exist, it is their "symphonic arrangement" that gives charm. As someone has

said, "We fall in love with charming people, not with their traits or qualities."

Growing Professionally. It is imperative that teachers continue to improve themselves. A growing self is an essential of a good teacher. Growth may be expected to require striving. Plants grow only when turgid. A similar principle seems to hold with people; limp, indifferent, effortless persons do not grow.

There are three aspects of improvement or growth for a teacher of agriculture: (1) his learnings of the facts, principles, and practices in agriculture, (2) the development of his ability to teach well, and (3) the development of his personal and social qualities. The teacher must grow in the abilities required for the specialized or definite service which is his field and must become a well-rounded, balanced person who looks upon life as essentially good and who contributes to the good life. He will, of course, make a special effort to improve himself in the aspect or aspects that most need improving. Being skilled in directing the learning process, he has mastered the essentials of guiding his own learning. He knows the effect on learning of effort and zeal and the desire to improve, the need for specific practice in the functions to be improved, the importance of goals, the necessity for a knowledge of success and error, and the value of planning definitely for his achievements.

Because the teacher values freedom, he should have his own program of improvement rather than be required to follow a program. It is always more enjoyable to live and work as one who *ought* rather than one who *must*. A great deal of a teacher's self-improvement can come from conscientious preparation for the performance of his regular duties. This is economy of time and effort. There should also be a supplementary plan which involves a definite attack upon one's problems. Such a plan is far superior to general reading courses for im-

provement. Self-improvement is worth planning for; results are likely to be in keeping with one's plan and how consistently and methodically he follows it.

The Master Teacher. Every teacher should strive to be a *master* teacher. Becoming a master teacher requires much study, enduring effort, the "losing of one's self" in his work. A vast gulf exists between the mediocre teacher and the master teacher, between poor teaching and excellent teaching. From poor to excellent is always great. The touch of a master's hand makes a world of difference in teaching just as it does in playing a violin.

No Permanent Satisfaction. It is said that there is a restlessness in every artistic spirit that shall never know a permanent satisfaction in anything done. This applies to the artist teacher. With each achievement in teaching—each cycle completed—something is realized that gives satisfaction, but with each there is a lurking discontent. At each step in achievement, the artist teacher feels a dissatisfaction creeping into it, and so he tastes the bitterness that comes to all who seek the superlative. Such is the penalty of the creative life. Only the mediocre can rest upon their laurels, expecting their cup of triumph to remain full.

Final Word. In bringing this book to a close, and this chapter on teaching agriculture as a profession, the author rejoices with his readers that there is still left to us a new frontier. These lines were written by Dorothy Calloway:

> There is still left to man a new frontier,
> Let none believe there is no virgin soil
> For venturing, no land for pioneer
> To prove with plow and harrow. Fruit of toil
> Beyond the dream of harvesters remains.

INDEX

A

Abilities, as teaching objectives, 57–58
  manipulative (*see* Manipulative abilities)
Ability to learn, 91–92
Activities, F.F.A., 233–235
Administration of agricultural extension and vocational agriculture, 307–309
Adult farmer, characteristics of, 270–271
Adult-farmer courses, defined, 269–270
  objectives of, general, 274
  preparing, 281–283
  teaching, 267–286
Adult learning, 47–49
Agreement, arriving at, 197–200
  defined, 197
  written, advantages of, 201
Agriculture, as an art, 3–4
  a changing, 70–72
  defined, 3
  development of, in the schools, 304–306
  educational values in, 9–10
  as a mode of life, 5
  number engaged in, 10
  as a science, 5
Agricultural education, aims and functions of, 6–7
  vocational, purpose of, 7
  (*See also* Education)
Annoyances, 17–20, 43
Appreciations, 160
Art, agriculture as an, 3–4
  defined, 4
Aspiration, level of, 42–44
  annoyance, related to, 43
Association, principle of, 21–25
Attitudes, defined, 153
  developing, 153–162
  importance of, 153
  as influencers of learning, 154
  how learned, 155–156
  as objectives of teaching, 153, 161
  relation of, to appreciations, ideals, and understanding, 156–161
  as teaching objectives, 58

B

Beef cattle, as a project, 190–191
Behavior, innate, 1
  learning as change in, 1, 12–13

C

"Calling" aspects of vocation, 6
Capacity to learn, 49–50
  distribution of, 49–50
Census data, use in course building, 72, 73–76
Childhood learning, 46–47
Class projects, 177
College teaching of agriculture, 315–325
  correlation of courses in, 324–325

College teaching of agriculture, hindrances to improvement in, 317
  method in, 319–324
  objectives of, 319
  practice, relating to theory in, 323–324
Community map, 227
Concepts, 2
  as generalizations, 28–29
Cost-of-production summary, 211–213
County agent, as a teacher, 310–312
Course building, a responsibility of the teacher, 64
Course of study, for adult farmers, 281–283
  constructing a, 63–95
  cross-section-type arrangement of, 87
  defined, 63
  factors to consider in, 64–82
    characteristics and needs of students, 65–66
    educative environment, 66–67
    information available, sources of, 67–69
    purpose of the course, 64–65
    requirements of the vocation, 69–82
    uses to be made of the learning, 69
  for high school students, 83–94
    arranging by years, 86–92
    arranging within the year, 92–93
    farming programs of boys, considering the, 83
    illustrations of four-year layout, 89, 90
Course of study, for high school students, preparing time allotments for, 93–94
    summary of steps in, 94
  teaching objectives in, 83–86
  (*See also* Adult farmers; General agriculture; Prevocational agriculture; Young farmers)
Crop projects, guidance in deciding on, 188–189
Curriculums, 7
  vocational, basis for choosing, 293–294
Curve, learning, in acquiring manipulative skills, 148

D

Dairy, cost-of-production percentages, 199
  income percentages, 199–200
Dairy cattle, as a project, 191
Demonstration, giving a, 131, 150–151
Difficulty, as a factor in course building, 91 [101
  locating, in problem solving, in situations, 106–107
  as a prerequisite to thinking, 100, 101
Drill, 30

E

Education, agricultural, aims and functions of, 6–7
  cardinal principles in, 298
  as a continuous process, 47
  importance of, 8–9
  subsidizing, in agriculture, 11
Educative environment, 67
Effect, principle of (*see* Learning)

Efficiency factors, 213–214
Elementary agriculture, teaching, 287–292
End reports, 217
Enterprises, distribution of, on farms surveyed, 81
  relative importance of, 73, 74
Entertainment, education as, 21
Evaluation, 326–336
  of attitudes, 332
  improving, 333–336
  of information, 331
  of managerial abilities, 331–332
  of manipulative abilities, 330–331
  in relation to motivation, 328–329
  in relation to objectives, 327–328
Experience, as a factor in learning power, 48
Experiences, reinterpreting, 10
Extension, agricultural, 7–8
Extension Service, 304
Extension teaching, 304–315
  administration of, 307–309, 313–314
  development of, 304–307
Extension work, field and functions of, 309–310
  in relationship to public schools, 312–315

F

Farm demonstration work, 305
Farm experience, placement for, 174–175
Farm jobs, calendar of, 225, 227
Farmer, adult (*see* Adult farmer)
Farming, good, elements of, 80–82
Farming, standards and practices, evolution of, 70–71
  supervised, of adult farmers, 283–286
Farming programs, characteristics of good, 183–185
  financing of, 187–188
  good, illustrations of, 125–176
  guiding students in projects for, 179–196
    crops, 188–189
    improvements, 193–194
    livestock, 189–193
    supplementary farm practices, 194
  making arrangements for, 196–202
    for fair rental or share agreement, 197–200
  modern concept of, 177–178
  reasons for, 179–183
  records on, keeping, 205–210
    (*See also* Records)
  relation of, to course of study, 170
  and relationships with parents, 194–195
  returns from, 180, 183
  supervised, in vocational agriculture, 171–178
  supervising (*see* Supervised farming)
  of young farmers, 262–266
  (*See also* Projects)
Feed cost of producing a unit, 214
Financing, as related to project selection, 187
4-H club work, 8, 238–241
  definition of, 239–240
  place of, in educational program, 241

Future Farmers of America, 229–237
  activities, 233–234
  aim and purposes of, 232–233
  degrees of membership in, 231
  development of, 230–231
  emblem of, 232
  group projects, 177
  organization of, 231
  teacher responsibilities in, 235–237

G

General agriculture, 7
  in high school, a place for, 298–300
  program of, suggestions for, 302–303
  teaching, 297–303
  units for, 300–302
Generalizations, 25–31, 127, 139
  as basis for transfer of learning, 30–31
  behavior as evidence of, 28
  commonness of, 27–28
  concepts as, 28–29
  definitions as, 27
  ideals as, 28
  introducing statement of, 30
  rules as, 27
  as a subverbal process, 29
Goals, 100
  as influencers of learning, 41
  for learners, 18
  necessity for, in developing manipulative abilities, 145–146
  production, 185–186
Group problem-solving defined, 136
Group projects, 176–177
  (*See also* Farming programs)
Group teaching, defined, 108

H

Habit, 115
  and flexibility, 39–40
  formation of, 38–41
    effect of knowledge on, 40
  versus skill, 40
Hatch Act, 305
Hogs, as a project, 191–192
  weight at various ages, 218

I

Ideals, as generalizations, 28
  defined, 158–159
  establishing, in developing manipulative abilities, 145
  as motivators, 159
  in relation to goals, 159
Improvement projects, guidance in, 193–194
  (*See also* Projects)
Independence, achieving, 181
Intelligence, abstract, 149
  as a factor in learning manipulative skills, 148–149
  mechanical, 149
Intelligence quotients, 50
Intensity, a factor in learning, 17
Interest, contagious, 115
  effect of, on learning, 154
  implied in a problem, 110
Interests, 157–158
Inventory, 207

J

Job analyses, 56

K

Kinesthetic sense, role of, in manipulative learning, 143–144

Knowledge of success and error, 43–44, 147
Knowledges as teaching objectives, 59

L

Labor, probable returns from, 186–187
Laboratory exercises, place of, in problem solving, 131–132
Laboratory work, 321–322
Land-grant College Act, 304
Learning, an active process, 12, 161–162
  annoyingness, influence on, 17–20
  aspects of, selected, 25–41
    generalization, 25–31
      (*See also* Generalization)
    habits, 38–41
    meaning, acquiring, 31–33
    observation, 33–37
    thinking, 100–102
  as change in behavior, 1, 12–13
  by doing, 14
  factors influencing, 41–49
    age of learner, 46–49
    aspiration, level of, 42–44
    capacity to learn, 49–50
    goals or objectives, 41–43
    knowledge of success and error, 43–44
    seeing relationships, 44
    understanding, 44–46
  as the goal of teaching, 52
  principles of, 13–35
    by association, 21–25
    from effect, 17–21
    by practice, 13–17
  process of, defined, 1
  providing needs for, 42
  significance of, 1–3
Learning, unverbalized, 108
Lecturing, 277
Lesson plan, for problem solving, 135–136
  for teaching adults, 281
Level of aspiration, 42–44
  as gravitation toward achievement, 43
Library, agricultural, 303
  requirements for, 119
Livestock projects, guidance in deciding on, 189–193

M

Management, prime factor in farming vocation, 295–296
Manipulative abilities, defined, 141
  developing, 141–152
  learning the act of, as a whole, 146–147
    factors and aspects in, 143–149
    goal in, necessity for, 145–146
    ideals in, importance of establishing, 145
    intelligence as a factor in, 148–149
    kinesthetic sense, role of in, 143–144
    knowledge of success and error in, 147
    learning curve in, 148
    in relation to problem solving, 142–143
    speed vs. accuracy in, 147–148
    teaching procedure for, 149–152
  in relation to teaching objectives, 141–142
  visual aids, role of, in teaching, 144–146

Manipulative abilities, teaching, during supervisory visit, 222–224
Map, community, 227
Maturation, 91–92
Meaning, acquiring, 31–33
Measurement, relations to motivation, 328
(*See also* Evaluation)
Mechanical intelligence, 149
Memorization learning, 140
Mode of life, agriculture as a, 5
Morrill Act, 304–305

N

Needs for learning, providing, 107
New Farmers of America, 237–238
degrees of membership in, 238
emblem of, 238
Nonuse, influence of, in learning, 15

O

Objectives, adult-farmer courses, 274
attitudes as, 153–161
of college teaching of agriculture, 319
deciding on, for group teaching, 84–85
in teaching, 51–62, 326–327
abilities as, 57–58, 60
attitudes as, 58
characteristics of good, 54–55
determining, 55–61
knowledges as, 59
statements of, 57–61
preparing, 61
relation to evaluation of, 326–328
Objectives, in teaching, relation of, to units, 62
of young-farmer work, 249–252
(*See also* Goals)
Observation, defined, 33–37
and participation, 37
requirements for effective, 35–37
visual aids to, 33
Organs, sense, development of, 34
Overlearning, 15, 84

P

Parent education, 195
Parents, cooperation of, in selecting farming programs, 194–195
Participating experience in vocational choice, 294–295
Partnership, 201–202
Part-time farming, 85–86
Pictures, errors in effective use of, 36
motion, 37
use of, in teaching, 36–37
Poultry, as a project, 192
Planning, necessity of, 168
lesson, 135–136
Plans, writing (*see* Project plans)
Placement, for farm experience, 174–175
Practice, areas in which needed, 164–165
defined, 13
knowledge of results necessary in, 44
necessity for, in learning agriculture, 180
need for supervising, 165–167
as principle of learning, 13–17
role of, in learning, 163–164
reversion to previous, 24, 169–170

Practice, supervised, relation to course of study, 170
role of, in teaching, 167–170
and theory, 323–324
(*See also* Farming programs; Supervised farming)
Practices, farm, a reliable basis for, 68
Prepotency, 29
Prevocational agriculture, 7, 91
standards of, 295–296
teaching, 292–296
Principles as generalizations, 27
Problems, adjusting to level of group, 133
analyzing, 98, 116–118, 128
arranging, 111–112
characteristics of good, 109–111
finding, 107
formulating, 105–112
group, defined, 136
individual, defined, 136
individual solving of, 119–124
motivating, 113–115
presenting, to class, 97, 112–119
scope of, 111
situations, in relation to, 113
as source of motivation, 132
statement of, illustration, 98
teaching students to solve, 120
Problem solving, adapting to groups, 132–134
conclusions, arriving at, 124–134
defined, 96, 136
directing study of, 119–124
handling references in, 118–119
individual, 136–138
laboratory exercises in, place of, 131–132
lesson plan for, 135–136
limitations of, 138–140
Problem solving, questions in, use of, 129–131
reasons for use of, 102–105
in relation to thinking, 99–102, 124
teacher supplied information in, 134
typical procedure in, 97–98
use of, in teaching, 96–141
adults, 277–281
young farmers, 261–262
Probable returns from labor, 186–187
Production goals, 185–186
Production per person, 9
Productive-enterprise projects (*see* Projects)
Profession, teaching agriculture as a, 337–344
"Progress reports," 217
Projects, class, 177
crop, guidance in deciding on, 188–189
group, 176–177
improvement, 172–173
livestock, guidance in deciding on, 189–193
productive-enterprise, 171–172
(*See also* Farming programs)
Project plans, 203–204
writing, 202–205

Q

Questions, formulating good, 129, 130–131
answers to, treating, 131

R

Records, interpreting, 215–216
keeping, 205–210, 266
reasons for, 206

Records, summarizing, 211–215
teaching students to keep, 209–210
using, 216–218
Relationships (*see* Learning, factors influencing)
Rental agreement (*see* Agreement)
Research, the foundation of agricultural progress, 68
Rules as generalizations, 27

S

Satisfaction, 17–19, 43
Scope of problem, 111
Sheep as a project, 192
Situations, difficulties in, 106–107
problems in, 113
old, tendency to react to, 24, 169–170
Skill, 4
(*See also* Manipulative skills)
Smith-Hughes Act, 306, 307
Smith-Lever bill, 305, 310
Standard of perfection, 16
Standards as generalizations, 28
Students, bright, keeping busy, 121–122
slow, helping, 121
Subject matter, good organization of, 25
Success, and error, knowledge of, 43–44
influence of, on learning, 21
Summarizing records on farming programs, 210–215
Supervised farming, devices helpful in teaching, 224–228
community map, 227
job calendar, 225, 227
visitation record, 224–226
farm, programs for, 218–228
Supervised farming, modern concept of, 177–178
persons to be supervised in, 227–228
supervisory visits, purposes of, 220–222
teaching during, 222–224
of young farmers, 262–266
(*See also* Farming programs; Practice)
Supervision, necessity for, 17
role of, in teaching an improved practice, 167–170
Supervisory visits, purposes of, 220–222
record of, 224–226
teaching during, 222–223
Supplementary farm practices, 173–174
guidance in deciding on, 194
Surveys, community, use in course building, 76–78
form for making, 79–80
tabulating data from, 77–78
Suspense, use of, in problem solving, 126

T

Teachers, contribution of, 338–339
as producers, 51–52
qualities required, 318
charm, importance of, 341
selection of, 340–341
Teaching, acquiring ability in, 339
defined, 1
significance of, 3
during supervisory visit, 222–224
Teaching objectives, 250–251, 259–260, 319
Teaching procedure, in adult-farmer work, 277–281

Teaching procedure, for manipulative abilities, 149–152
problem solving, 96–141
in young-farmer work, 261–262
Test or measure of learning, 327
Theory and practice, 22, 23, 323-324
Thinking, direction of, in problem solving, 116
the process of, 100–102
reasons for, while learning, 102
reflective, 102
in relation to meaning, 32
without action, 127
Time allotments in course building, preparing, 93–94
Tobacco, Burley, cost of production, 200
Trueness to life, defined, 111

U

Understanding, and application of knowledge, 45
as influence on learning, 44–46
in relation to attitudes, 156–157
in relation to thinking, 45
securing, 32–33, 139
Understanding or trade agreement, 197
Units in teaching, 62
Unverbalized learning, 108
Usage (*see* Practice)

V

Visit (*see* Supervisory visit)
Visual aids, relation to observation, 33
Visual observation in developing manipulative abilities, 144–145
Vocation, defined, 6
Vocational agriculture, aim of, 171
course arrangements in high school, 87–90
Vocations in agriculture, 6

W

Wants, influence on learning, 18

Y

Young-farmer courses, teaching, 242–266
Young-farmer work, concept and general plans for, 252–253
course of study for, 257–260
need for, 243–247
objectives of, 249–252
planning, 255–257
supervised farming in, 262–266
teaching procedure in, 261–262
Young men on farms, characteristics of, 247–249